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WOOD-TAR CREOSOTE.

By Lyman F. Kebler.

Research Committee E, Pharmacopœia Revision.

Creosote is a complex mixture of phenoloid compounds, the proportions of which are materially influenced by the kind of wood employed for distillation, the methods resorted to for purifying and removing the creosote from the distillate and the amount of certain constituents removed from the creosote proper, by fractional distillation.

The above mixture of compounds consists chiefly of several homologous series, prominent among which are the acid methylic esters of catechol, but any of the compounds contained in the following table may be met with.

Names.[1]	Formula.	Boiling-Point.
MONOHYDRIC PHENOLS.		
Phenol, carbolic acid,	C_6H_5OH	182° C.
Paracreosol, cresylic acid,	$C_6H_4(CH_3)OH$	203° C.
Xylol, or phloral,	$C_6H_3(CH_3)_2OH$	220° C.
METHYL ESTERS OF DIHYDRIC PHENOLS.		
Guaiacol or methyl catecholate,	$C_6H_4\left\{\begin{matrix}OCH_3\\OH\end{matrix}\right\}$	200° C.
Creosol or methyl methyl-catecholate,	$C_6H_3(CH_3)\left\{\begin{matrix}OCH_3\\OH\end{matrix}\right\}$	219° C.
Homocreosol, or dimethyl-guaiacol,	$C_6H_2(CH_3)_2\left\{\begin{matrix}OCH_3\\OH\end{matrix}\right\}$	230° C.
Cœrulignol, or propyl-guaiacol,	$C_6H_3(C_3H_7)\left\{\begin{matrix}OCH_3\\OH\end{matrix}\right\}$	241° C.

Creosote is generally supposed to consist, for the greater part, of

[1] After Thorpe, *Dict. of Applied Chemistry*, Vol. I, 614.

guaiacol and creosol, the former predominating in one case and the latter in another. This idea has become so prevalent among some, that they thought guaiacol to the extent of sixty or more per cent. could easily be obtained by fractionating a good quality of creosote. Such may have been the quality of creosote years ago, but things have changed. It is claimed that when a demand arose for guaiacol and its salts, the proportion of this valuable compound began gradually to diminish, until to-day it has become difficult to purchase creosote containing 20 per cent., and an article containing 60 per cent. is a curiosity. The above demand may have had an influence, but the writer is inclined to look at it somewhat differently. The high percentage of guaiacol reported by some workers was probably due to faulty methods of analysis.

A. Béhal[1] and E. Choay, on fractionating genuine beechwood creosote and analyzing those portions coming over between 200° and 210° C., and 200° and 220° C., found them to have the following composition:

	Boiling-Points, 200–210° C. Per Cent.	Boiling-Points, 200–220° C. Per Cent.
Monophenols	39·00	39·00
Guaiacol	26·48	10·72
Creosol and homologues	32·14	39·98
Loss	2·38	1·30

The above analyses indicate that a specimen of creosote containing 25 per cent. of guaiacol is a fairly good one. Other recent analyses contribute towards this view. But it must be remembered that, while the larger proportion of the guaiacol distils between the above temperatures, not all comes over. This is well shown by the results of the present investigation. Those samples beginning to boil at about 210° C. (corrected) contain the largest amount of guaiacol. The probable reason for finding the guaiacol in higher fractions is that we find it almost impossible to closely separate by fractionation the various components of complex mixtures, like creosote. It has been found that a fraction of creosote coming over between 200° and 210° C. may contain a goodly per cent. of phenol having a boiling-point 20° below the lowest boiling-point. And the same fraction has been found to contain more than one-third its weight of creosol, a body having a boiling-point of 219° C.

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[1] 1894, *Comp. rend.*, *119*, 166.

It is sometimes very difficult to differentiate between the various creosotes. Especially is this the case when slight admixtures are dealt with. Qualitatively, beech and oak creosotes are alike. This is probably true of other creosotes. E. Hirschsohn[1] has compared beechwood tar with the tars of birch, fir and juniper. Apparently he has established identity tests for the several products when unmixed. But it is the writer's experience that when mixtures of the above substances are met with, many uncertainties present themselves.

Distinctive tests for creosote itself are found in books, but they are of little service in practice, where positive results only can be relied on. For example, carbolic acid, cresylic acid and creosote can readily be distinguished from one another, but it is quite a different thing if mixtures of these substances have to be dealt with. The simultaneous presence of these substances seriously modifies the identity tests.

Oak wood creosote is much more caustic than beechwood. This is due to the fact that the former contains a larger proportion of the monophenols and a correspondingly smaller amount of guaiacol than the latter. Both contain about the same amount of creosol and its homologues. Pine wood creosote distilling between 200° and 220° C. was found[2] to contain 40 per cent. of monophenols, 20·3 per cent. of guaiacol and 37·5 per cent. of creosol and its homologues.

There is also some difference in the specific gravities of the various creosotes. The U.S.P. requires a specific gravity not lower than 1·070 at 15° C., while the B.P. is more rigid, in that the lowest limit cannot be below 1·079 at 15° C. The former can easily be met with by a creosote that does not contain any guaiacol. It seems desirable to make this requirement slightly more rigid.

From the above statements, it can readily be seen that the analyst is liable to be confronted with considerable vagueness when he attempts to identify the various creosotes and mixtures of the same. But be this as it may, we are, nevertheless, able to get at the quality of a creosote very closely by careful examination, as the data in the table below will show.

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[1] 1898, *Pharm. Ztg. f. Russl.*, *35*, 801.

[2] 1894, *Comp. rend.*, *119*, 1276.

No.	Specific Gravity.	Boiling-Point. Celcius.	Per Cent. of Substance Distilled Between the Following Temperatures, C.° Corrected.					
			?–200°	200–205°	205–210°	210–215°	215–220°	220–238°
1	1·0748	195–224	5	34	26	23	6	3
2	1·0748	195–222	20	20	30	19	7	1
3	1·0650	210–238	00	00	00	30	25	40
4	1·0642	208–238	00	00	2	37	21	36
5	1·049	188–220	18	12	12	39	14	—
6	1·069	200–225	32	18	10	24	9	4

No.	Color.	Reaction.	No of C.c. of 7·5 Per Cent. NaOH Solution Required to Dissolve 2 C.c. of Creosote.	The Glycerin-Water Test.	20 C.c. of Alcoholic Potash Mixed with 1 C.c. of Creosote.
1 . .	Nearly colorless	Faintly acid	9	Normal	Crystals in 15 minutes. Solid in 40 minutes.
2 . .	Nearly colorless	Faintly acid	8	"	No crystals in 5 hours. Solid in 18 hours.
3 . .	Amber	Faintly acid	9	Emulsion	Crystals in 4 minutes. Solid in 15 minutes.
4 . .	Straw color	Neutral	7	"	Solidified almost immediately.
5 . .	Nearly colorless	"	8	"	Solidified on cooling.
6 . .	Nearly colorless	Faintly acid	8	Normal	" "

No.	Per Cent. of Guaiacol.	Per Cent. of Potassium Guaiacol and Creosol.
1	None	60
2	"	48
3	8	60
4	16	106

The six samples were obtained directly, as far as could be ascertained, from as many manufacturers. The boiling-points, as well as other tests, show that all of the samples fail to comply with the U.S.P. requirements. There was a slight residue in every case on distillation. The alcoholic potash-creosote mixture proved the most interesting. With Nos. 1, 2, 3 and 4 the mixture was made at the ordinary temperature, and the last two according to the directions of the Pharmacopœia.

The guaiacol was estimated by the following process: Mix 5 c.c. of creosote with 50 c.c. of a 20 per cent. alcoholic solution of potassium hydrate; in from 10 to 30 minutes a crystalline mass will result, due to the combination of guaiacol and creosol with the potassium. Press crystalline mass between filter paper until dry, place into a test-tube, add 5 c.c. of 10 per cent. sulphuric acid, heat mixture a moment and the guaiacol and creosol will rise to the surface of the liquid. Dilute sufficiently with water so that the oily portion will sink to the bottom, decant aqueous portion and add 4 c.c. of concentrated ammonia water. A hard crystalline compound is immediately formed with the guaiacol, and after some time a semi-crystalline mass results with the creosol. On treating the above crystalline mixture with benzin, all but the ammonium compound of guaiacol is dissolved, and separation can be effected by decantation and washing or filtration and washing. Acidulate the solid residue with 10 per cent. sulphuric, extract the guaiacol by means of benzin and evaporate in a tared vessel.

To differentiate between creosote and phenols, thoroughly agitate one volume of the creosote with diluted glycerin (3 of glycerin to 1 of water), then set aside for separation. The diminution in the volume of creosote indicates roughly the amount of soluble impurities.

The barium hydroxide test for cœrulignol and other high-boiling constituents was also applied, but their presence was not revealed in any case.

The *collodion test*, the *ferric chloride* test and the *bromine* test did not give results on which any reliance could be placed.

In the writer's experience the pharmacopœial requirements should be based on the following points: physical appearance, reaction, solubility, specific gravity (not below 1·080 at 15° C.), boiling-point (200 to 220° C.), reaction with a 20 per cent. absolute alcoholic potassium hydrate solution, and a test for neutral oils, although this is indicated by the boiling-point.

NEW ALKALOID IN STAVESACRE. F. B. Ahrens (*Ber. d. D. Chem. Ges.*, 1896, p. 1581) has discovered a new alkaloid in *Delphinium Staphisagria*, which he has called *Staphisagroin*, the formula of which is $C_{20}H_{24}NO_4$, and it does not give any of the color reactions of the Delphinium alkaloids.

ALKALOIDS OF ANHALONIUM LEWINII. E. Kander (*Archiv. d. Pharm.*, 1899, p. 3) finds, beside *Mescalin*, *Anhalonidin* and *Lophophorin*, two other bases, viz., *Pellotin* and *Anhalomin*.

HYDROGEN PEROXIDE AS A TEST FOR SALICYLIC ACID.

By W. E. Ridenour.

The writer, having had a quantity of sodium salicylate which was not of the required whiteness, attempted to bleach the same by the use of hydrogen peroxide, whereupon the sodium salt developed a beautiful cherry red color. The thought then suggested itself that hydrogen peroxide might be used as a test for salicylic acid, and a series of experiments were performed for determining its availability in this respect.

The United States Pharmacopœia gives the following characters and tests of identity for salicylic acid: Physical appearance; solubility in different solvents; melting-point; reaction with ferric chloride, and odor in the presence of sulphuric acid and methyl alcohol upon heating. In addition to these, the British Pharmacopœia gives the uranium nitrate test. In Prescott's "Organic Analysis" we also find the following: Reactions with bromine water, nitric acid, copper sulphate, glucose, sodium amalgam, and lime.

Before giving the results of his experiments the author wishes to state that the value of hydrogen peroxide as a test for salicylic acid depends upon the presence of an ammoniacal solution of ammonium carbonate, the U.S.P. solution having been found best adapted for the purpose; also that the solution of hydrogen peroxide used contained 2·301 volumes of available oxygen. The solution of sodium salicylate designated in the first column of the following statements was a 10 per cent. solution.

	Sodium Salicylate Solution, C.c. Taken.	Water Sufficient to Make 100 C.c.	Hydrogen Peroxide Solution, C.c. Taken.	Ammonium Carbonate Solution, C.c. Taken.	Color Reaction.
1 . . .	100	—	15	5	Dark garnet.
2 . . .	20	80	15	5	Amber.
3 . . .	1	99	15	5	Cherry red.
4 . . .	·5	99·5	15	5	Light pink or peach.

It will be found, upon calculation, that in experiment No. 4 the proportion of salicylic acid is 1 in 2,083 parts of water, and this was the weakest solution which gave the reaction.

It was found that, in using solutions of hydrogen peroxide of

greater strength than stated above, the color was at first developed, but rapidly disappeared.

Sodium Salicylate Solution, C.c. Taken.	Water Sufficient to Make 100 C.c	Chemicals Present.	Quantity of Chemical Taken.	Hydrogen Peroxide Solution, C.c. Taken.	Ammonium Carbonate Solution, C.c. Taken.	Color Reaction.
1	99	Ammonium oxalate.	·500 gm.	15	5	None.
1	99	Potassium nitrate.	"	15	5	Cherry.
1	99	Ammonium chloride.	"	15	5	"
1	99	Sodium benzoate.	"	15	5	"
1	99	Sodium and potassium tartrate.	"	15	5	Dark cherry.
1	99	Sodium phosphate.	"	15	5	Cherry.
1	99	Acid ammonium fluoride.	"	15	5	None.
1	99	Sodium borate.	"	15	5	Amber.
1	99	Sodium hyposulphite.	"	15	5	Light lemon.
1	99	Ammonium sulphate.	"	15	5	Cherry.
1	99	Gallic acid.	"	15	5	Lemon.
1	99	Sodium acetate.	"	15	5	Cherry.
1	99	Sodium sulphite (D. & P.).	"	15	5	None.
1	99	Potassium citrate.	"	15	5	"
1	99	Potassium chlorate.	"	15	5	Cherry.
1	99	Sodium hypophosphite.	"	15	5	"
1	99	Lactic acid, 75 per cent.	"	15	5	"
1	99	Tannin.	"	15	5	Yellow.
1	99	Potassium iodide.	"	15	5	Amethyst.
1	99	Potassium bromide.	"	15	5	Cherry.
1	99	Alcohol.	15 c.c.	15	5	"
1	99	Glycerine.	"	15	5	Deep peach.
30	—	Ammonium oxalate.	·500 gm.	15	5	Light amber.
30	—	Acid ammonium fluoride.	"	15	5	Garnet.
30	—	Sodium hyposulphite (D. & P.).	"	15	5	Lemon.
30	—	Sodium sulphite (D. & P.).	"	15	5	No color.
30	—	Potassium citrate.	"	15	5	Dark red.
1	99	Sodium sulphocarbolate.	"	15	5	Cherry.
1	99	Carbolic acid.	"	15	5	"
—	100	Sodium salicylate (natural).	·100 gm.	15	5	"

Replacing the solution of ammonium carbonate (U.S.P.) in experiment No. 3 (Table 1), by an equivalent quantity of 20 per cent. solutions of caustic soda, sodium carbonate (crystals), caustic potash, potassium carbonate and ammonia, no color reaction was observed. However, a simple solution of ammonium carbonate gave a light pink color, whereas an ammoniacal solution of ammonium carbonate as in experiment No. 3 gave a cherry red.

To show the influence of other chemicals on this test, the preceding table (No. 2) is presented.

It should be noted that in the above table (No. 2) where no reaction was obtained with the weaker solution of sodium salicylate, in most cases a reaction was obtained with a stronger solution.

It may furthermore be stated that none of the above chemicals alone gave a color reaction with hydrogen peroxide and ammonium carbonate, except gallic and tannic acids.

ODOR AS AN AID TO THE RECOGNITION OF DRUGS.

By Clement B. Lowe.

In considering the recognition of odors, we find that the sense of smell reaches its highest development in the mammalia, and that among many animals the olfactory nerves are exceedingly well developed. We are all acquainted with the fact that the fox hound will follow his prey at a rapid pace, being guided solely by the sense of smell; the bloodhound will also track a criminal along a travelled highway with unerring certainty, if first allowed to smell some of the criminal's garments; and that certain of the ruminants, as the antelope of the Western plains, escape from their enemies by means of this marvellously developed faculty. It is probable that the lower animals have the memory of smells unusually developed, that they thus receive impressions upon their mental consciousness which they could not obtain in any other way; for example, a dog, in making the acquaintance of a stranger, or in recognizing some one long absent, will frequently supplement the impressions received through eye and ear by those received through smell, before he becomes entirely friendly.

The sense of smell is very acute in some of the lower races of mankind, being far better developed than in civilized man. Humboldt states that "the Peruvian Indians can detect the approach of a

stranger, in a dark night, by the sense of smell, and can tell whether he is a white man, an Indian or a negro." The Arabs are said to smell a fire thirty miles off. There is an interesting case on record of a lad by the name of James Mitchell, who was born blind, dumb and deaf, who chiefly depended on smell for keeping up a connection with the outer world.

Amongst refined society, however, the word smell is almost tabooed. Dr. A. L. Benedict quotes Professor Woods Hutchinson as saying the present method of training children is such as to repress the intellectual use of the sense of smell. To smell food subjects the child to dismissal from the table; to ask, "What smells?" is considered vulgar; to say "Who smells?" is treated as an indecency. In fact, in our endeavor to be "nice," we even confuse the word "smell" with the always intransitive verbs "reek" and "stink," as is well illustrated by an anecdote of the lexicographer, Johnson. A lady, in remonstrating with him for his well-known carelessness in matters of toilet, said: "Positively, doctor, you smell." "You are wrong, madam," replied the doctor, "you smell, but I stink." Instead of blunting this sense, it should be cultivated and rendered more acute, as by means of it we are able to recognize the presence of deleterious gases and organic impurities in the air more quickly than by any scientific method. We are aided to a considerable extent in the selection of our food by the sense of smell; no one would think of eating any food having a rank or putrid odor; on the other hand, food having a pleasant odor, by reflex action, excites the flow of saliva (we say, makes the mouth water), and thus aids digestion. Odor may be considered one of the ways by which nature frequently gives warning of the poisonous character of plants, as in the case of cannabis indica, opium, tobacco, etc. The sense of smell is also an aid in differentiating many plants and drugs from one another, and what is almost of equal value, it enables us to judge to a considerable extent of their freshness. For example, the herb tansy, as frequently seen in the market, is much broken, so that its identity can only be determined by careful examination; but by rubbing between the hands a little of the drug, it can be recognized instantly, as its odor is more characteristic than either its flowers or incised leaves. Elecampane is also a drug with so characteristic an odor that the smallest piece of it can always be distinguished in this way. An odor makes the most acute impres-

sion at the first instant of its recognition, afterwards the mucous membrane of the nasal cavities (for a brief space of time) being clogged with the previous emanations, new odorous particles have difficulty in reaching the terminal nerve filaments imbedded in the mucous membrane. There is some little art in treating a drug so that its odor will be brought out most distinctly. If the drug is such that it can be readily powdered, then by rubbing a small portion briskly between the palms of the hands, so as to rupture the oil glands or resin cells, etc., and partly volatilize their contents, then by bringing the closed hands to the nose the odor will be most distinctly perceived. In the case of a hard drug, a little powder can be scraped off with a knife and treated in this manner.

Thinking that it might be of some value in the recognition of drugs, or at least give us truer ideas of their odors (as even the Pharmacopœia contains some incorrect statements concerning them), I have endeavored to work out a classification of drugs based on their odors. There are difficulties in making such a classification, as, on account of the personal element involved, no two investigators will probably agree to all of the conclusions reached; besides, it is exceedingly difficult to describe odors in words. In quite a number of cases a drug will be found to have almost equal affinities for two or more classes.

Classification of Drugs Based on Their Odors.

Division I. Drugs having an agreeable odor.

Class A.—Drugs with an Aromatic Odor. (Odors which are spicy or strong, and generally agreeable.)

(1) Those with a Simple Aromatic Odor.

(*a*) Odor Strong and Characteristic.

Asarum,
Anthemis,
Cascarilla (stronger when burned),
Gelsemium,
Hops,
Lupulin (strong on keeping),
Inula,
Marrubium,
Matricaria,
Rhubarb (peculiar),
Sage,
Tanacetum,
Sandal Wood (somewhat musk-like),
Wormwood.

(*b*) Odor Less Strong and not Characteristic.

Arnica Flowers,
" Rhizome,
Angustura (musty),
Calumba,
Eupatorium,
Juniper,
Melissa (fragrant, lemon-like when fresh),
Pilocarpus.

(2) Those with an Aromatic Mint-like Odor. (The mint odor predominating.)

Buchu, Peppermint, Spearmint, Horsemint, Pennyroyal.

(3) Those with an Aromatic Camphoraceous Odor. (The aroma has a suggestion of camphor in it.)

Calamus, Eucalyptus, Rosemary, Santonica, Serpentaria.

(4) Those with an Aromatic Spicy Odor. (The spicy odor predominates.)

Cloves, Ginger, Cubebs, Matico, Pepper, Pimenta.

(5) Those with an Aromatic and Fragrant Odor. (Odors which are strong, spicy and agreeable.)

Anise, Fennel, Illicium, } Anise Group.

Nutmeg, Mace, Cola, } Nutmeg Group.

Coriander, Caraway, Cardamom.

(6) Those with a Bitter Almond Odor. (Odor developed by moistening or bruising.)

Bitter Almond, Cherry Laurel Leaves, Wild Cherry Bark.

(7) Those with a Honey-like Odor.

Manna, Mel.

(8) Those with a Fenugreek Odor.

Elm Bark, Fenugreek, Marshmallow.

Class B.—Drugs with a Fragrant Odor. (Odors which are sweet-smelling and refreshing.)

(1) Those with a Simple Fragrant Odor.

Cinnamon, Canella, Cinnamodendron, } Cinnamon Group.

Bitter Orange Peel, Sweet " " Lemon " " } Citrus Family Group.

Gaultheria, Sweet Birch, } Wintergreen Group. Sassafras, Vanilla (peculiar).

(2) Those having an Odor of Flowers.

Orange Flower, Pale and Red Rose, Orris Root (violet odor).

(3) Those having an Odor of Tea.

Cusso (fragrant), Coca (slight), Digitalis (slight), Senna Indica, Thea.

(4) Those having an Odor of Chocolate.

Guarana, Cacao Butter.

(5) Those having a Fruity Odor.

Fig, Persimmon, Raspberry, Raisin, Prune (feeble),
Purging Cassia (Prune-like).

Class C.—Drugs with a Balsamic Odor. (Odors which are aromatic and resinous.)

(1) Those with a Simple Balsamic Odor.

Eriodictyon, Grindelia, Myrrh,
Guaiacum Wood (when heated).

(2) Those with a Balsamic and Fragrant Odor. (Odors which are balsamic and agreeable.)

Benzoin, Storax, Sweet Gum,
Bals. Tolu (Vanilla-like), Bals. Peru (also empyreumatic).

(3) Drugs with a Balsamic and Terebinthinate Odor. (Odor increased by heating.)

Burgundy Pitch, Gum Olibanum, Rosin (faint),
Canada Pitch, Mastiche, Tar (empyreumatic),
Canada Turpentine, Sandarac, Thuja,
Turpentine.

Class D.—Drugs with Peculiar Odors.

Camphor (penetrating), Capsicum, Senna Alex.,
Cochineal, Gentian (sweet), Saffron (peculiar aroma),
Convallaria, Jalap (smoky, sweetish), Uva Ursi (hay-like),
Coffee (faint in green state), Quercus (tan-like),
Pulsatilla (aromatic and hay-like).

Class E.—Drugs with a Slight Odor.

(1) Those having a Characteristic Odor.

Logwood (faint, agreeable), Rumex, Red Saunders.

(2) Those not having a Characteristic Odor.

Aspidium, Catechu, Chimaphila, Cypripedium,
Aspidosperma, Caulophyllum, Cimicifuga, Dulcamara,
Castanea, Cetraria (odor when wet), Cinchona (somewhat aromatic),
Euonymus, Nutgall (when bruised), Menispermum,
Frangula (little odor when dry), Juglans, Sarsaparilla (earthy),
Scutellaria.

DIVISION II. DRUGS WITH DISAGREEABLE ODORS.

Class A.—Drugs with Narcotic Odors. (Odor heavy and somewhat stupefying.)

Belladonna Leaves and Root (slight), Hyoscyamus (heavy),
Calendula (somewhat heavy), Lactucarium (somewhat heavy),
Cannabis Indica (heavy), Lobelia (slight),
Chelidonium (strong when fresh), Tobacco (heavy, peculiar),
Stramonium Leaves (slight).

Class B.—Drugs with Alliaceous Odors. (Sulphuretted odors resembling garlic.)

Asafetida, Garlic, Sinapis Alba and Nigra (when moistened).

Class C.—Drugs with Valerianaceous Odors. (Odor produced on keeping, by oxidation of the volatile oil.)

Lupulin (when old), Valerian, Viburnum Prunifolium.

Class D.—Drugs with Animal-like Odors.

Ambergris, Oxgall, Pepsin (should be slight),
Cantharides, Musk, Sumbul,
Civet, Pancreatin (faint, peculiar),
Conium (mouse-like when triturated with potassa).

Class E.—Drugs having Disagreeable Characteristic Odors.

(1) Odors which are Strong.

Ammoniac, Copaiba, Podophyllum,
Aloes, Ergot, Senega (strong in fresh root),
Chenopodium, Galbanum, Stillingea,
Sabina.

(2) Odors not Strong.

Apocynum, Iris, Strophanthus,
Chondrus (seaweed-like), Lappa, Scoparius (when bruised),
Hydrastis, Scammony (cheese-like), Sambucus,
Ipecac (nauseous when powdered), Stramonium Seed (when bruised).

DRUGS WHICH ARE DESTITUTE OF ODORS.

Acacia (odor sometimes sour), Physostigma, Taraxacum,
Aconite, Cotton Root Bark, Phytolacca Root and Fruit,
Asclepias, Granatum, Pyrethrum, Tragacanth,
Bryony, Hamamelis, Quassia, Triticum,
Chirata, Kamala, Quillaja, Veratrum Viride,
Castor Oil Beans, Kino, Rhamnus Purshiana,
Croton Oil Beans, Krameria, Rhus Glabra, Viburnum Opulus,
Chrysarobinum, Leptandra, Rhus Toxicodendron,

Cocculus Indicus,	Linum,	Rubus,	Xanthoxylum,
Colchicum Root,	Lycopodium,	Sassafras Pith,	
Colchicum Seed,	Mezereum,	Squill,	Tea.
Colocynth,	Nux Vomica,	Sweet Almond,	
Gamboge,	Pareira,	Sinapis Alba and Nigra (when dry),	
Geranium,	Pepo,	Tamarind,	

THE STRUCTURE AND DEVELOPMENT OF INTERNAL PHLOEM IN GELSEMIUM SEMPERVIRENS, AIT.[1]

By Caroline B. Thompson, B.S.

The following is the result of observations made during the winter of 1897–98, in the Botanical Laboratories of the Biological Department of the University of Pennsylvania. The material used consisted of specimens of varying age, preserved in alcohol, which had been collected by Professor Macfarlane, while on a trip to Wilmington, N. C., and of seedlings grown in the greenhouses of the department from seeds collected by him. An abstract of the observations upon the stem was read at the meeting of the "Society for Plant Morphology and Physiology," held at Ithaca, N. Y., in December, 1897.

GENERAL LITERATURE.

In the early years of the present century much confusion existed in regard to the terms for the softer elements of a vascular bundle. These were variously called bast fibres, bast cells, latticed cells, sieve fibres, etc. Hartig, in 1837, was the first to correctly describe such elements as sieve tubes, and to regard them as the essential constituents of the phloem. Several years later, Hartig's observations were confirmed by von Mohl, Nägeli and Hanstein. The investigation of plants with internal phloem, or phloem on the inner margin of the wood, was begun by Hartig in 1854, and continued by others. The orders Cucurbitaceæ, Asclepiadaceæ and Apocynaceæ were among the first to be studied. In 1875 de Bary originated the term "bicollateral bundle," a name that has been objected to by many of the later workers. From that time onward the number of investigators and the detail with which the work has been carried out have steadily increased. The most important contributions to the litera-

[1] "Transactions and Proceedings of the Botanical Society of Pennsylvania," Vol. I, No. 1.

ture of this subject have been made by Vesque, Weiss, Russow, Petersen, Van Tieghem, Fischer, Scott, Gérard, Hérail, Lignier, Leonhard and Lamounette.

Various views are held by different writers upon the relation between the internal phloem and the other parts of the bundle. Some believe with de Bary that an actual bicollateral condition exists, and that the internal phloem is as much a part of the bundle as the external, and is of similar origin. Others, notably the French botanists Hérail and Lamounette, believe that the internal phloem is independent of the bundle and of different origin.

The following papers have been specially consulted:

Solereder, H.—"Ueber den systematischen Werth der Holzstructur bei den Dicotyledonen," 1885.

Scott and Brebner.—"On the Anatomy and Histogeny of *Strychnos*." *Annals of Bot.*, Vol. III, 1889.

Scott and Brebner.—"On Internal Phloem in the Root and Stem of Dicotyledons." *Annals of Bot.*, Vol. V, 1891.

D. H. Scott.—"On Some Points in the Anatomy of *Ipomœa versicolor*." *Annals of Bot.*, Vol. V, 1891.

Hérail.—"Recherches sur l'Anatomie comparée de la Tige des Dicotylédones." *Ann. des Sc. Nat. Bot.*, Sér. VII, T. II, 1885.

Lamounette.—"Recherches sur l'origine morphologique du Liber Interne." *Ann. des Sc. Nat. Bot.*, Sér. VII, T. XI, 1891.

LITERATURE RELATING TO GELSEMIUM.

Gelsemium sempervirens is commonly known in the Southern States as the "Yellow Jessamine," and is placed in the order Loganiaceæ by Solereder, Engler and Prantl and Gray; in the order Apocynaceæ by Baillon, Le Maout and Decaisne.

In the Laboratory Contributions from the Biological Department of the University of Pennsylvania for 1884, J. G. Shoemaker has a few notes on the stem of *Gelsemium*. He remarks the widening of the medullary rays, and "the tendency of the pith to be penetrated by several plates of large thin-walled cells, which divide the pith more or less perfectly into four portions."

Professor Rothrock, in February, 1885, made a short verbal communication to the Philadelphia Academy of Natural Sciences concerning this stem. His attention was attracted by the fact that the diameter of the pith is greater in a very young twig than in a stem

four times its size. He notes the presence of the four medullary phloem patches, and their encroachment upon the pith area.

A great deal of work has been done upon *Gelsemium* from a chemical and pharmaceutical standpoint, but its structure and development have not been thoroughly worked out. The root contains an alkaloid gelsemin, which is very poisonous, but is a valuable medicine when taken in proper quantities. The medicinal properties of *Gelsemium* were accidentally discovered about the middle of this century. An interesting account of the discovery and the primitive method of extracting the poisonous principle from the root is given by William Procter, Jr., in the AMERICAN JOURNAL OF PHARMACY for 1852.

Other records of the investigations upon the alkaloid gelsemin are to be found in later numbers of this JOURNAL, and in the "Proceedings of the American Pharmaceutical Association."

HISTOLOGY OF A ONE-YEAR-OLD STEM.

A transverse section, about 1 millimetre in diameter, of an internode at the close of the first year's growth shows the following structure (*Fig. 1*). Externally are three to four layers of cork, still covered in places by the prominently ridged cuticle; next is the cortex, consisting of a zone of parenchyma four to five cells deep, rich in protoplasm and containing abundant chlorophyl and starch grains. A ring of large sclerotic cells, which appear in longitudinal section as clear refractive fibres of considerable length, lies on the outer margin of the vascular bundle portion of the stem. The bundle cylinder consists first of a zone of external phloem about six cells deep. Most of the cells are still embryonic, with large nuclei and abundant protoplasm, some few have differentiated into sieve tubes. In longitudinal section the sieve plates can be recognized. The septa are large, transversely placed, and bear either four or three sieve plates with numerous perforations. The cambium layer is clearly defined by its regular brick-shaped cells with large nuclei.

The wood is a broad zone, occupying more than a third of the area of the section, and is traversed radially by the oblong, deeply pitted cells of the medullary rays. A longitudinal section through the wood shows numerous spiral tracheæ in the inner or protoxylem region; external to this are both short and long tracheids,

whose walls are thickened and deeply pitted. Large vessels are numerous in the outer portion of the zone.

On the inner side of the wood lie four large rounded patches of internal phloem extending into the pith. These patches are two to three times broader than the external phloem zone, and consist also of sieve tubes and undifferentiated phloem elements. The inner margins of the phloem patches are bounded by a two-celled layer, which may be termed a phloem sheath (*Fig. 1*). This is sharply differentiated alike from the adjoining pith cells and from the phloem. A row of somewhat similar but smaller cells separates

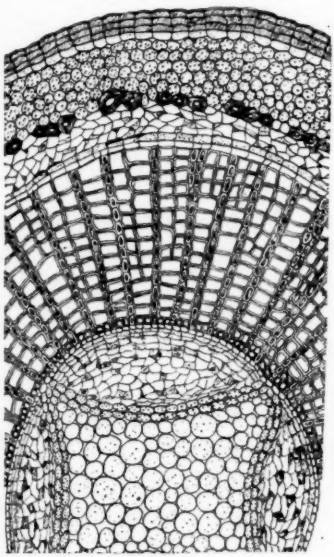


FIG. 1.

FIG. 2.

the outer margin of the phloem patches from the wood, and immediately internal to this row are the patches of medullary cambium. The cambium cells have the usual brick-like shape, thin walls and large nuclei. The cells of the sheath are rounded and in close contact with each other. They have thickened pitted walls and are conspicuous by their size and the large amount of chlorophyl and starch they contain. The pith cells are much larger, have thin but slightly pitted walls, and a scanty supply of chlorophyl and starch, while the intercellular spaces are larger than those of the phloem sheath. A few short sclerenchymatous or "stone" cells are some-

times present. Very early in the life history of the stem death of the pith cells occurs. The cell contents dry up, the pith as a whole shrinks away from the sides and becomes detached from the phloem sheath, but persists as an inert somewhat lignified mass, until its place is usurped by the enlarging phloem patches.

HISTOLOGY OF THE STEM FROM THE SECOND TO THE TENTH YEAR.

In a transverse section of a stem at the end of the second year's growth, the most prominent change is the increased size of the internal phloem patches. Each has pushed farther out into the pith, and as the growth has been greater in the middle than at the sides, the inner margin has a curved outline, with the convexity toward the pith. The formation of new cells from the medullary cambium takes place centrifugally, the newly formed cells lying external to the old. On the inner side of each patch, adjoining the phloem sheath, a dark crescentic mass of partially obliterated tissue is now evident. This is composed of the older sieve tubes that have collapsed and been pushed together by the pressure from the new elements laid down by the active medullary cambium.

The external phloem has increased but little in breadth, in comparison with the internal patches, but the total number of cells and the actual area of the zone is greater than before. Here and there along the border are darker areas, composed of four or five compressed cells, showing that the same crowding and obliteration goes on, although to a less extent than in the internal patches.

In older stems the increased size of the internal phloem patches becomes more and more prominent. The masses of crushed tissue or "Hornbast" (*Fig. 2*) are more numerous and broader, the later formed ones lying in concentric layers external to the older masses. Some large phloem parenchyma cells are often present between the crushed masses, for they are better able to resist the crushing process, owing to their greater turgidity. The patches may thus present a stratified appearance from the alternation of the bands of crushed tissue and the scattered parenchyma cells. Each of the four patches usually divides into two parts, so that in the oldest stems eight cone-shaped masses of internal phloem are present. The neighboring patches grow together laterally, while they continue to encroach upon the pith. In the oldest stem examined (*Fig. 2*), of about twelve years' growth, the internal phloem patches

entirely fill the former pith area, except a very small space in the centre, where a shrunken thread of dead tissue represents all that remains of the pith. The patches by this time are composed almost wholly of "Hornbast." Only a few sieve tubes are distinguishable, and these are more or less distorted. The contrast between the large cells of the phloem sheath and the dark crushed masses is very striking.

The breadth of the external phloem, which, during the first few years, was less than that of the internal patches, increases greatly in older stems. In a six-year-old stem its breadth almost equals that of the patches; in a ten-year-old stem it exceeds them. The same alternation of bands of "Hornbast" with parenchyma cells occurs as in the internal patches, but as the pressure conditions are different here the bands are narrower and less marked. As the growth has been centripetal, the newly formed tissue lies internal to the old.

The widening of the medullary rays is very noticeable in older stems. The width of a ray at the periphery of the wood is six or eight times greater than at the centre. Elongated cells, that are continuations of the rays, separate the cone-like masses of the external phloem zone.

HISTOLOGY OF A NODAL SECTION.

Near a node the circle of wood and external phloem becomes elliptical, and the patches of internal phloem lie at the ends and sides of the ellipse. The end patches are considerably larger than the side ones and are further divided into a central and lateral portion, the former for the petiole, the latter to remain in the stem. Higher up, the ends of the ellipse curve out more and more, and soon separate from the sides to form the petiolar bundles. Each bundle is accompanied by a portion of the internal phloem, so that at first the petiolar bundle is composed of external phloem, wood and two small masses of internal phloem. Left in the stem are the two long lateral curves of wood and external phloem as before. The two small groups of internal phloem that remained behind at each end now move together to reconstitute the end patches. Above the node the wood reunites into a continuous ring, while at the next node above, the leaf bundles will be given off from the opposite sides of the stem.

The petiolar bundles are at first distinctly bicollateral. Numerous patches of external phloem border upon the outer or lower face of the wood, and on its inner or upper face are two clearly defined patches of internal phloem. Almost immediately after the petiole has separated from the stem, the main petiolar bundle gives off two small lateral branches. These bundles consist chiefly of external phloem with a little xylem. They continue upward through the petiole and along the sides of the leaf, where their branches anastomose with branches from the main leaf bundle. A remarkable change soon takes place in the main petiolar bundle of a kind which, so far as I am aware, has not previously been described. Just above the point where the lateral petiolar bundles branched off, *the two internal phloem patches, one after the other, pass downward and outward through the wood to join the external phloem.* In a transverse section of a petiole, the phloem strands may be seen in longitudinal section passing between the xylem cells. They bend outward along a radius of the bundle, and in a definite position, at about one-half of the distance from the periphery to the mid-line of the bundle. After the passage of these strands, there is no further trace of internal phloem in the petiole or leaf.

HISTOLOGY OF THE ROOT.

The structure of a very young root, in transverse section, is illustrated in *Fig. 3*. The loose-celled starch-bearing cortex, about seven to eight cells deep, is separated by a thin-walled endodermis from the axial vascular cylinder. The bundle is typically diarch. The two groups of the protoxylem consist each of about six spiral tracheæ, and between them at the sides of the bundle lie two small patches of phloem, separated from the protoxylem by the procambium, a layer of large prominently nucleated cells. Outside the xylem and phloem elements, and just within the endodermis, is the pericambial zone. Later, by secondary growth, the xylem is united into a central cylinder, surrounded externally by a ring of phloem, but internal phloem is entirely absent in the root.

On older roots irregular warts or swellings are frequently found, which, when sectioned, reveal a vigorous fungoid growth. The fungoid hyphæ ramify through the cells of the inner and especially the middle cortex, and in some places large cavities occur, resulting from the breaking down of the cortex cells. These are filled with

the coiled hyphæ and the fructifications of the fungus. Starch is usualiy absent in the cells inhabited by the fungus. In the root of a seedling about six weeks old, the fungus was already well established in many cortex cells.

HISTOLOGY OF THE SEEDLING.

The diarch condition of the root is continued in the hypocotyl, and it may at once be stated that the median plane of the two protoxylem masses corresponds to the median plane of the cotyledons. The spiral tracheæ of each end have at first a Y-shaped arrangement, the arms of the Y pointing toward each other, thus, —<

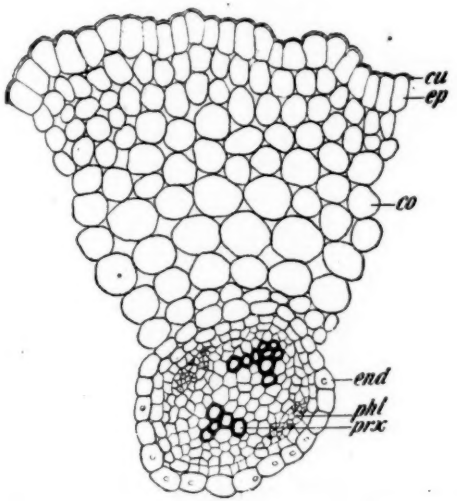


FIG. 3.

>—, but as the hypocotyl increases in age, the cells of the arms move apart, taking a lateral position, with the phloem external to them, usually two patches to each side. This is illustrated in *Fig. 4*.

As differentiation proceeds more spiral tracheæ are interpolated between those already formed, so that a continuous ring of protoxylem is finally present. The phloem consists of small patches of finely divided cells, along the outer margin of the sides of the wood, but is not yet continued around the ends. At the level of the cotyledons, the phloem from the sides bends toward the ends, and the zone is thus completed. No recognizable internal phloem could be distinguished in the young hypocotyl.

In an older hypocotyl, in which secondary growth has gone on for some time, the fundaments of two internal phloem patches may be observed just below the cotyledonary node. The round hypocotyl becomes elliptical, preparatory to the separation of the cotyledons. Five or six large embryonic cells appear on the inner side of the wood. Their nuclei are large, and take a darker stain than the adjoining cells. In short, the fundament of an internal phloem patch has arisen in the leaf trace bundles, destined for the first, third, fifth and succeeding pairs of leaves. No such fundament is demonstrable in the pair of bundles for the cotyledons, second,

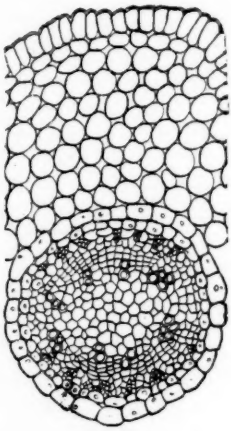


FIG. 4.

fourth and succeeding pairs of leaves. With increased age these embryonic cells become a mass of small, finely divided cells, so that evidently the bundles for the odd pairs of leaves each possess an internal phloem patch. Throughout the lower and middle portions of the epicotyl, or the internode above the cotyledons, the opposite bundles are devoid of internal phloem, but just below the node bearing the first pair of leaves, two groups of embryonic cells appear in them, representing the fundaments of the internal phloem patches for the even pairs of leaves. When the node bearing the second pair of leaves is reached, all four patches of internal phloem are clearly distinguishable. In the bending out of the leaf bundles into the petioles, the same crossing of the internal phloem to the exterior takes place in the leaves of the seedling that has been de-

scribed above for adult leaves. Scott, in his work upon *Ipomœa versicolor*, found that in the hypocotyl near its junction with the root, the internal phloem passed through the xylem and joined the external phloem. He was thus able to prove the continuity of the phloem throughout the plant. Similar phenomena were observed by Gérard in different plants. There is no trace of any continuity between the external and internal phloem of the hypocotyl of *Gelsemium*. The course of the bundles throughout the hypocotyl and stem is indicated in the diagrammatic figure below (*Fig. 5*).

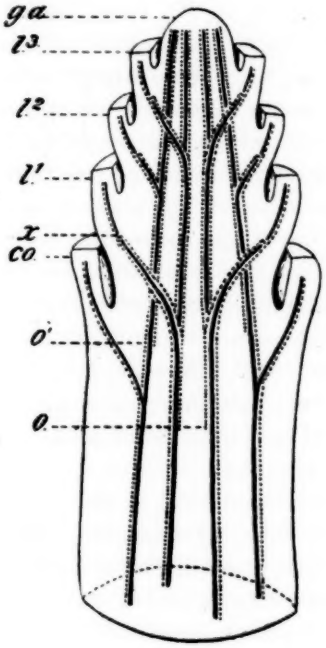


FIG. 5.

o, origin of first pair of internal phloem patches ; o^1, origin of second pair ; *co*, cotyledon ; l^1, first foliage leaf ; l^2, second foliage leaf ; l^3, third foliage leaf ; *ga*, growing apex ; *x*, crossing of internal phloem to exterior.

ORIGIN OF THE INTERNAL OR MEDULLARY PHLOEM.

In the growing apex of the stem the first cells to differentiate from the primary meristem are the spiral tracheæ of the protoxylem, which are arranged in radial rows. On their outer border ap-

pear groups of very small, thin-walled cells, whose division walls lie in all planes. Soon thereafter similar groups of small cells are differentiated on the border of the pith area. These represent the internal phloem patches. The course of the internal phloem has been traced in older stems into the petioles, so it may be regarded as an integral part of the leaf trace bundle. It owes its origin to the same primary meristem that gives rise to the external phloem, and the protoxylem. Certain primary meristematic cells on the inner face of the protoxylem represent the medullary cambium. To the later activity of these cells the secondary growth of the medullary phloem is due. A radial arrangement of the later-formed medullary phloem cells is to be observed, and is an indication of their cambial origin. The medullary phloem appears in the hypocotyl some time after the differentiation of protoxylem and external phloem. Its origin, however, is from embryonic cells that are a part of the original primary meristem of the bundle. The appearance of these embryonic cells, on the inner side of two bundles in the hypocotyl, at a definite point below the cotyledonary node, and of similar cells in the two opposite bundles in the epicotyl, just below the first leaf node, may be explained as follows, on phylogenetic grounds. Internal phloem is a secondary character acquired during the evolution of the plant. Since the hypocotyl and cotyledons are embryonic structures representing the primitive stages of growth of the plant, characters that have been acquired by, and are adapted to, the adult stem, may reasonably be found absent throughout the whole, or a part, of the hypocotyl. In this plant the lower portion of the hypocotyl exhibits the ancestral condition in the absence of internal phloem. The upper portion of the hypocotyl and of the epicotyl are transition stages, for two bundles have acquired internal phloem, while two bundles are as yet devoid of it. The region of the first leaf node shows the acquired condition of the presence of internal phloem in all four bundles.

The physiological significance of this acquisition, and the causes that led to it, are not clear. It is a noteworthy fact that internal phloem appears only in parts of this plant where pith is present. Although present in the stem, internal phloem is absent throughout the greater length of the petiole. It is present in the upper portion of the hypocotyl, but is absent in the lower part where the pith area is becoming constricted by inward growth of the xylem. Both in-

ternal phloem and pith are absent in the root. In plants like *Strychnos*, whose roots possess medullary phloem, pith is always present.

The view may be advanced that to utilize the pith area, either for more perfect protection of the phloem, in these twisted and at times contorted stems, or to increase the total amount of it, a portion of the external phloem, during the evolution of the plant, dipped in from the bases of the petioles, through the fissures formed by the leaf traces in the vascular cylinder, and became internal in position. The climbing habit of this plant may be one of the factors in its evolution.

SUMMARY OF RESULTS.

(1) The internal phloem arises primarily as four longitudinal strands, which are an integral part of the leaf trace bundles.

(2) The origin of the internal phloem is simultaneous with, or slightly later than, the protoxylem and external phloem, so that the leaf trace bundles are bicollateral from the first.

(3) The internal phloem patches are bounded internally by a two-celled phloem sheath.

(4) The internal phloem patches grow centrifugally by means of a medullary cambium, the inner and older layers in time becoming crushed and obliterated.

(5) Death of the pith occurs early in the first year.

(6) The continued disintegration of the pith and growth of the internal phloem results in the filling up of the pith cavity with the latter.

(7) The internal phloem, which runs into the petiole, constitutes there at first a bicollateral bundle system, but at the base of the petiole it descends through the xylem as two strands, and from this point upward the primitive collateral bundle system prevails.

(8) No internal phloem is present in the root.

(9) A copious fungoid growth is found in the cortex of the root. Absorption of starch usually results in cells inhabited by the fungus.

(10) No internal phloem is present in the lower portion of the hypocotyl, nor in the cotyledons.

(11) Two of the internal phloem patches of the stem arise just below the cotyledonary node, the other two just below the node bearing the first pair of leaves.

(12) Internal phloem is an acquired characteristic of the plant, and has probably been developed in these long and at times twisted stems, to supplement the external phloem.

RECENT LITERATURE RELATING TO PHARMACY.

A SUBSTITUTE FOR HYDROGEN SULPHIDE IN ANALYSIS.

Any means, whereby the unpleasant, unstable and inconvenient hydrogen sulphide can be replaced in analytical practice attracts the chemist; hence a recent article on the subject by M. Vogtherr (*B. d. Dtsch. Pharm. Ges.*, 1898, 228) is worthy of careful attention.

The writer, after reviewing the various suggested substitutes for hydrogen and ammonium sulphides, concludes that most favorable for this purpose are the sulphur derivatives of carbonic acid, and shows that of these the most acceptable are such as have the sulphur in a thio (SH) group. The best of these, he thinks, is ammonium di thio-carbonate, $CO(SNH_4)_2$, which he prepares by mixing five parts of carbon disulphide with nine parts 20 per cent. ammonia in a glass-stoppered bottle and shaking at ordinary temperature as long as carbon disulphide is dissolved, whereupon the excess of ammonia is neutralized with hydrochloric or acetic acid.

The product is an orange-yellow liquid, of scarcely any sulphide odor, containing 10 per cent. to 12 per cent. ammonium di thio-carbonate, 8 per cent. ammonium chloride, and traces of ammonium sulpho-cyanate and ammonium sulphide.

If necessary, a 30 per cent. solution, as stable as ammonium sulphide, can be made. Its only inconvenience is that it stains the skin brown.

The writer gives an elaborate report on the action of the reagent on metals, finding its behavior almost identical with that of hydrogen sulphide.

He then outlines a new table of analysis, covering the minor divergences from hydrogen and ammonium sulphides. Its essential points of difference from the usual methods of analysis (see Sadtler and Trimble, Vol. II) are noted below. In this statement the letter *R* means ammonium dithiocarbonate solution, and the individual identity reactions are omitted.

After precipitation of *Pb.*, *Ag.* and *Hg(ous)* by hydrochloric acid, the scheme continues by precipitating, from the boiled and cold filtrate, the metals *Hg(ic).*, *Bi.*, *Cd.*, some *Co.*, *As.*, *Cu.*, *Sb.* and *Sn.* by *R* instead of by hydrogen sulphide. This precipitate is warmed with excess of reagent.

A.—Warm *R* does not dissolve *Hg.*, *Br.*, *Pb.*, *Cd.* and some *Co.*

B.—Warm *R* dissolves *As.*, *Cu.*, *Sb.* and *Sn.*

Filtrate from *R* precipitate is boiled with nitric acid and tin-foil (to remove oxalates and phosphates and to oxidize the iron) and is made alkaline with ammonia and boiled.

C.—Precipitate of *Fe.*, *Al.* and *Cr.*

To filtrate from C is added cold *R.*

D.—Precipitate of *Co.*, *Ni.*, *Zn.* and *Mn.*

Filtrate from D handled as usual for separation of alkaline earths (ammonium carbonate, sodium phosphate, etc.).

The separation of *Group A* is as in Sadtler and Trimble, save that *Cd.* and *Co.* remain in last ammonia solution. These metals are separated by neutralizing with hydrochloric acid, adding potassium cyanide and precipitating *Cd.* from this solution by *R.* The *Co.* in filtrate is separated by potassium nitrite.

Group B is separated from its solution in *R* by hydrochloric acid.

(a) Precipitate shaken with ammonium carbonate. *As.* dissolves.

(b) Precipitate treated with cold *R.* *Cu.* dissolves.

(c) Precipitate treated with hot *R.* *Zn.* and *Sb.* dissolves.

These are separated as in Sadtler and Trimble.

Group C is dissolved in hydrochloric acid.

(a) Acid solution treated with potassium hydrate. *Fe.* and *Cr.* precipitated.

Precipitate fused with potassium nitrate and sodium carbonate and treated with water. *Cr.* dissolves; *Fe.* remains.

(b) Filtrate from "a" neutralized with hydrochloric acid and cooked with ammonia. *Al.* precipitated.

Group D is warmed with 5 per cent. hydrochloric acid.

(a) Residue *Co.* and *Ni.*

Separated as in Sadtler and Trimble, or with potassium nitrite.

(b) Acid solution treated with potassium hydrate. *Mn.* precipitated.

(c) Filtrate from "b" treated with *R.* *Zn.* precipitated.

H. V. Arny.

CONSTITUENTS OF CHEIRANTHUS.

M. Reeb reports (*J. d. Pharm. von Elsass-Loth.*, 1898, 207) a chemical investigation of the leaves and seeds of *Cheiranthus cheiri*, a common crucifera of Europe, sometimes cultivated and closely allied to the nasturtium.

After noting that Schlagdenhauffen and Reeb, Sr., had found the

extract was toxic to frogs, the writer reviews the confusing nomenclature of the plant and announces the separation of an alkaloid, as well as a glucoside similar to digitalin.

The separation is accomplished by treating the seeds, from which the oil (35 per cent.) has been removed (with petroleum ether) or the leaves with 65 per cent. alcohol. The alcoholic extract (yield from leaves 26 per cent.; from seed 47 per cent.) is dissolved in water, the solution cleared with lead acetate, filtered and the lead removed from the filtrate by careful addition of sulphuric acid, the formed lead sulphate being filtered off. From the filtrate the active principles can be separated either by precipitation with tannin (as directed by Tanret for the preparation of digitalin) or with a neutral salt like ammonium sulphate, as recommended by Thomas in the manufacture of strophanthin. In both cases the alkaloid and the glucoside are precipitated together, and are separated from the precipitant by solution in 2 parts alcohol and 1 of ether. These are separated by shaking an aqueous solution with ether (which dissolves only the alkaloid, or by precipitation of the alkaloid with phosphotungstic acid. The glucoside, cheiranthin, thus isolated, is faintly buff, is soluble in water, alcohol, chloroform and acetone, and insoluble in ether and petroleum ether. It hydrolyzes to a product that reduces Fehling's solution, and to one insoluble in water, but soluble in ether. Administered to a frog, it affects the heart as does digitalin. The alkaloid was not thoroughly examined, nor was a second inert alkaloid, presumably choline.

H. V. A.

SODIUM OXALATE AS A BASE FOR STANDARDIZING SOLUTIONS FOR ACIDIMETRY AND ALKALIMETRY.

S. P. L. Sörense ignites a given weight of sodium oxalate in a platinum crucible and uses the resulting carbonate in adjusting the acid. The advantages claimed are: (1) that it can be secured pure and dry; (2) it does not contain any water of crystallization and must, therefore, be of uniform composition; (3) it is neither deliquescent nor efflorescent, consequently the article can be kept any length of time without undergoing any change and can be weighed accurately. 1898, *Rev. de Chim. Industri*, *9*, 304; from *Jour. Soc. Chem. Ind.*, *18*, 74.

L. F. KEBLER.

EDITORIAL.

SUMMER WORK AND SUMMER VACATION.

To probably most people the summer vacation is associated with the thought of a time for securing physical culture, a recuperation of health and rest of mind from the exacting cares of the remainder of the year. A great many people, in taking their summer vacation, are physically recuperated by visiting places where the nights are cool and the air is pure; or by engaging in a strictly out-door life, either on the water, in fishing or sailing, or in the woods, camping and hunting. A great many persons also either own or rent summer residences, and devote their time to bathing, driving and riding, and to receiving their friends. Those who prefer a quiet life are distinguished from those who visit the hotels at the fashionable watering-places and mountains, in that the latter are beset with temptations for gluttony and intemperance, so that their vacation may resolve itself into a time of indulgence, rather than a time for recuperation of any kind.

There is a broader significance and value, however, in the summer vacation when it is associated with mental and spiritual culture, and this is what most people would call summer work. When one of the most esteemed citizens of the United States the other day said in an address: "I am very glad that I broke through my determination not to interrupt my vacation, and that I broke into my outing to be here to-day," he expressed a thought which is becoming more and more evident in the desire of at least some persons for mental culture and the willingness of others to impart this culture. A summer vacation can hardly be said to be truly complete when it only brings one back with a few more pounds of flesh and an apparent rest of nerves and muscles. That vacation only is truly complete that has been devoted to one's hobby, and in which, in addition to a physical recuperation, one's mind and soul are refreshed, reanimated, re-purified and re-created. During an ideal summer vacation one ought not only to wade the trout-stream and fish, but one ought to find here an opportunity for work, if you choose to call it such, where the mind is quickened and the soul brought into close touch with nature and nature's God. Do we wonder, then, that the orations of Demosthenes are still heard, and that in our own country the words of Webster still live? The one perfected his creations at the seashore, and the other as he waded the trout-streams with his rod.

It is surprising, when we think of it, how the impulse for summer work (*i. e.*, mental and spiritual culture) is growing in this country. In order to afford opportunities of this kind, one of our universities has its courses extending throughout the entire year. Many others have been successfully carrying on summer schools; as Harvard, Cornell, University of Wisconsin, etc. Then there are special laboratories for investigation and research; as the Marine Biological Laboratory, at Wood's Holl, Mass., and the laboratory at Cold Spring Harbor, L. I. Besides these, a certain number of advanced courses are offered in various places by the Society for Promoting University Extension. There are also opportunities for more or less elementary study of various subjects; as in the Chautauqua Societies and in the Natural History Camps; and we might add that the various scientific and other associations that hold annual meetings during the summer draw a large number who not only desire an outing and a bodily recreation, but who desire food for thought and a re-creation

in mind and soul. It is astonishing, too, how well all of these institutions and associations are attended, and apparently the more advanced the character of the courses offered, the better is the attendance and the more earnest the desire for mental culture. It is not presumed that in any of these institutions for study the work is carried out with anything like the "grinding" that is done during the other months in the year. In fact, there is a freedom to do what one chooses. The field excursions, sailing parties, etc., are frequent. And, though all are arranged with some one object, they entail the absorption of facts and observations in other subjects that help to stimulate to a newer, broader and higher life.

The question may be rightly asked, what is the significance of this summer work with summer vacation? Does it mean that when the great Agassiz, whom we may justly claim as our own, through the generosity of Mr. John Anderson, of New York City, was enabled to establish his new scheme of education of natural history in the summer school on the island of Penikese, in Buzzard's Bay, that he comprehended the heartfelt needs of the seekers for summer work and summer vacation who yearned for something more than physical culture, and who were thirsting for intellectual and spiritual associations free from the daily routine which attends the ordinary pursuits of life, whereby to satisfy their minds' desire for the truth and the light? Does it mean that the silent prayer, so fitly told in Whittier's poem, "The Prayer of Agassiz," is being answered to the fullest extent, in that while at Penikese we now find the ruins of these first laboratories for summer work, a few miles away are the now famous laboratories at Wood's Holl, and scattered over the country are now offered many opportunities for the study of nature in her manifold forms? It is true that at these schools we find more generally teachers or those who may become teachers, and it may be said that this combination of summer work and summer vacation is only a result of the "hurry-up" spirit of the times. We believe, however, that it rather speaks of the faithfulness of the teachers to their scholars in their desires for a grasp on the newer world of facts as revealed by other observers and a stimulus for future investigations.

Some may go to the summer schools because of a sense of duty, and some may be impelled by a sense of thrift, but the majority go because their aspirations lead them, like the wise men of old, to a common place, where they may not only open the door of nature, but where they may also learn of the interpretations of the observations of others; for as Emerson puts it: "into every intelligence there is a door which is never closed, through which the Creator passes." The real significance, we think, of these summer schools and the opportunities for summer work is the association with nature for intellectual and spiritual as well as physical culture. The greater benefits of the summer schools are observed in the more nearly uniform development of the intellectual, spiritual and physical nature.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

COMMERCIAL ORGANIC ANALYSIS. By Alfred H. Allen. Third edition. Edited by Henry Leffmann, M.D. Vol. II, Part I. Fixed oils, fats, waxes, glycerol, nitroglycerin and nitroglycerin explosives. Philadelphia: P. Blakiston's Son & Co. 1899. $3.50.

This volume of Allen's well-known book is one of the most valuable, dealing, as it does, with the whole range of the fatty oils and their products. The previous second edition was a most satisfactory reference-book for chemists, and its value has been distinctly added to in this revised edition. It is true that there has appeared in the meantime a special work on this general subject that has immediately taken first rank, viz., Lewkowitsch's English edition of Benedict's "Oils, Fats and Waxes," but there is room for both books. While Allen is not quite so encyclopædic in taking up the list of fatty oils, his discussion of analytical methods is, in many cases, fuller and more satisfactory, and some of the technical side products of great importance find more adequate notice in Allen than in Lewkowitsch.

As in Vol. I of the American revised edition, noticed in this JOURNAL, Vol. LXX, p. 629, frequent reference is made to the official methods adopted by the Association of Agricultural Chemists, and these are given in full detail. Thus, on p. 38, we have the method for the determination of melting-point; on p. 59, Vollny's modification of Reichert's method in full, as adopted by the Association; and, on p. 183, the methods now adopted for butter analysis.

The special points of value in this revised edition are quite numerous, and we cannot more than select a few for special mention. The tables of the refractive power of different oils with the oleo-refractometer, on pp. 73 to 75, are valuable when taken with the working directions for the use of the instrument given on p. 72.

Twitchell's recent method for separating the fatty and resin acids is given, and fully discussed on p. 107.

The mention, on p. 150, of the newer siccatives, which are used in solution, such as the resinates of manganese and lead, is also satisfactory, as is the account of the use of aluminum oleate in adulterating heavy mineral oils for the purpose of fraudulently increasing the viscosity of the oil.

Very timely and important is the attention paid to the analysis of nitroglycerin and dynamite, on p. 337, and of cordite and smokeless powders, on p. 343.

The section on cloth oils (or wool oils), on p. 369, is also new and of great value.

We notice that reference is made at several points to Lewkowitsch's work on Oils, but no page is mentioned. This is a drawback, as it simply involves loss of time, if one must hunt it up from the index or table of contents.

We also looked in vain, under the mention of the tests for adulteration of olive oil, for Milliau's modification of Becchi's test. This modification has been endorsed by official recognition in both France and Italy as an improvement upon the original Becchi test.

The book, taken altogether, however, is simply indispensable to the working chemist who is interested in the chemistry of either food adulteration or the technical application of fatty oils. S. P. S.

DIE ÆTHERISCHEN OELE von E. Gildemeister und Fr. Hoffmann. Bearbeitet im Auftrage der Firma Schimmel & Co., in Leipzig. Mit vier Karten und zahlreichen Abbildungen. Berlin: Verlag von Julius Springer.

The progress of organic chemistry has in many instances placed many of the commercial industries on a more or less sound scientific basis. The more or less crude empirical methods have been supplanted by the more rational modes

of procedure in preparing the various commercial products. During the past ten years there has been witnessed, particularly in the researches of the ethereal oils, a most remarkable development, particularly through the researches of Professors Wallach, Baeyer and some other chemists. Probably no one has encouraged the scientific study of the essential oils to such an extent, and collated and distributed so much information relative to the newer scientific developments, and the substitutions and adulterations of the essential oils than have Messrs. Schimmel & Co., and no one is so familiar with all that is known, both in a commercial and scientific sense, in regard to ethereal oils as this firm. The preparation of the various natural oils is still regarded by some as an agricultural industry, but the chapter by Dr. C. von Rechenberg, in this new book, on the theoretical principles for the production of essential oils by means of distillation with steam, indicates, however, that a study of the laws of physics, particularly of heat, has much to do in the securing of not only quantity, but quality of product. The study of these oils for purposes of identification, detection of adulteration, as well as synthetic preparation and imitation requires, as is becoming more and more recognized, the most carefully trained specialists in this subject. Dr. E. Gildemeister, one of the editors of this book, is well known for his studies in this direction. The historical treatment of the essential oils in this work has been creditably performed by the able pen of Dr. Fr. Hoffmann.

The book is divided into four parts :

I. A historical treatment of the spices and allied products is given, particularly during ancient times and the middle ages ; also a historical treatment of essential oils with the old and new methods and apparatus employed in obtaining the same. Numerous well-made illustrations accompany the text, and we have, in the 136 pages devoted to this part of the work, a very comprehensive review of the progress in the discoveries and knowledge pertaining to essential oils, as well as their preparation from ancient times to the present as carried out in the largest laboratories devoted entirely to this subject to-day.

Part II is devoted to a general consideration of the subject of essential oils, and several specialists have written certain chapters. Dr. C. von Rechenberg has written a special chapter on the "Theoretische Grundlage der Gewinnung der ätherischen Oele durch Dampfdestillation," and Dr. J. Helle has contributed an article on "Die Häufiger vorkommenden Bestandtheile der ätherischen Oele." Two other important chapters complete this part of the book, viz.: one on the testing of ethereal oils and another with the names of the plants, arranged according to Engler's Syllabus (1898), that yield ethereal oils.

Part III, comprising over 600 pages, is devoted to a special consideration of all of the essential oils. It may be truly said that everything that is known concerning the history, origin and distribution of the plants producing the oils and the percentage of the latter, together with their general, physical and chemical properties, as well as chemical composition, adulteration, production and commercial importance, is here given. The citation of the important literature, together with the other information given, makes this part indispensable to every one, whether he be teacher, manufacturer, merchant or student, who has anything to do with the study or handling of essential oils. The character of the work

done and the fact that it has been brought up to the date of publication, are shown in many instances, of which we mention one. Under the constituents of American peppermint oil where in addition to the fifteen constituents of this oil, already noted by Power and Kleber in 1894, two other principles are added, viz.: Amyl alcohol and dimethyl sulphide $[S(CH_3)_2]$. The fact, too, that so much comparative information is given as, for instance, in the treatment of the properties of the different peppermint oils of America, England, Japan, Saxony, Germany, France, Italy, Bohemia, Chili and Peru, renders the work of inestimable value to the student, manufacturer and dealer in essential oils.

Part IV contains an index of plant names, oils and their constituents, which renders the work convenient for reference and all that is to be desired in this respect.

The binding and printing of the book are in accord with the contents of the book, and we have not seen a work recently which we consider of such scientific and practical value, and one which was needed so much by every one who has anything to do with the essential oils or the plants yielding them.

We are confident that this volume will be much appreciated by the botanist and chemist, as well as by the manufacturer and merchant, and recognized as a repository of everything pertaining to the scientific as well as practical and commercial knowledge of the essential oils.

AN INTRODUCTION TO THE STUDY OF MATERIA MEDICA, being a short account of the more important crude drugs of vegetable and animal origin. Designed for students of pharmacy and medicine. By Henry G. Greenish, F.I.C., F.L.S., Professor of Materia Medica and Pharmacy to the Pharmaceutical Society of Great Britain. With 213 illustrations. Philadelphia: P. Blakiston's Son & Co., 1012 Walnut Street. Price, $5.25 net. 1899.

This book reminds us very much of the materia medicas heretofore published. Several features are, however, worthy of note. It has been gotten up for students by one who has evidently gone to the trade centres for information, and who has carefully sifted the literature and studied the drugs described. This really makes it that the work speaks with something of authority on the sources, descriptions, constituents, uses and varieties of the drugs described. There is another valuable feature of the book in that the author credits the illustrations, when taken from other works, to the authors of them. Not only is this done in the preface, but the name of the author accompanies the illustration. The book is a valuable one, and notwithstanding its high price will doubtless have a large sale in this country among the students of pharmacy and medicine, for whom it was designed.

THE BOTANISTS OF PHILADELPHIA AND THEIR WORK. By John W. Harshberger, Ph.D., Instructor in Botany, University of Pennsylvania.

An introductory account is given of the rise and progress of botany in the region comprised within a radius of sixty miles of Philadelphia. Especial emphasis is laid upon the history of botany at the University of Pennsylvania, Academy of Natural Sciences, Philadelphia College of Pharmacy, American Philosophical Society in connection with other learned societies. A brief sketch is given of the region and its floral districts.

The biographical portion of the book concerns itself with the lives of the botanists prominent as collectors or authors. The only complete account of

John Bartram and his celebrated garden is contained within this book. Especial emphasis has been laid upon the early botanists and their published work. Those prominently identified with the progress of pharmaceutical botany are included.

The botanists of our own day come in for a considerable share of the biographer's attention. A unique feature of the book is the illustrations, chosen with much care. These illustrations preserve in an unchangeable manner the appearance of the more celebrated gardens and botanists, many reproduced for the first time by the photographer's art. In the appendices an historical sketch is given the scientific journals issued from the Philadelphia printing houses, as also an account of trees which are noteworthy either from a botanical or historical standpoint.

BRITISH PHARMACEUTICAL CONFERENCE.

The thirty-sixth annual meeting of the British Pharmaceutical Conference was opened on July 25, 1899, at Plymouth, Ireland. The city, which has been described as the metropolis of the West, abounds in many glorious historic associations. The President, J. C. C. Payne, of Belfast, gave a short account of the history of pharmacy in Ireland, which is an excellent *résumé* of the subject. Mr. Payne, in closing his address, referred to the bonds of fellowship which are growing between the pharmacists of Ireland and those of Great Britain. The fact that the meeting was held last year at Belfast, the commercial capital of Ireland, would seem to indicate a closer union and a stronger harmony tending to the advancement of pharmacy and all concerning it in all three countries during the new century now so fast approaching.

There were about the same number of papers communicated as in previous years, one of the most notable features being the fact that the authors are confining themselves year by year to strictly pharmaceutical topics, so that the year-book with the proceedings is becoming truly the repository of information pertaining largely to pharmacy. London was selected as the place of meeting of the Conference in 1900, and E. M. Holmes, Curator of the Pharmaceutical Society's Museums, was elected President for the year 1899-1900. The papers read at the Conference are reprinted in full in the *Pharmaceutical Journal* for July 29th, and we take pleasure in presenting brief abstracts of them as read and printed in that journal.

THE ASSAY OF THE OFFICIAL LIQUID EXTRACT, WINE AND VINEGAR OF IPECACUANHA.

By E. H. Farr and B. Wright.

The authors have examined several ipecacuanha percolates and fluid extracts and have compared the following assay processes: (1) The official and (2) Wilson's alternative process, with (3) a process proposed by them and (4) a modification of the same for rapid working. The following is the process proposed by these authors:

Five c.c. of the fluid extract is placed in a small porcelain dish, 10 drops of diluted sulphuric acid B.P. added, with 5 c.c. of water, and the mixture evaporated over a water-bath until the volume of liquid is reduced to about 3 c.c.

This is run into a separator, the dish carefully rinsed with 10 drops of water, and then with 15 c.c. of chloroform, the whole being transferred to the separator. An excess of ammonia is added, and the mixture well shaken, and allowed to stand until the chloroform has separated. This is run off, and the agitation and separation repeated with two successive quantities of 5 c.c. of chloroform. The chloroformic solutions are bulked, and the alkaloids extracted by shaking with three successive quantities of 10 c.c. 1 per cent. sulphuric acid. The acid alkaloidal solutions are drawn off in turn and mixed. The alkaloids are finally recovered from this solution by repeating the treatment with ammonia and chloroform. The solution of the alkaloids in chloroform is then evaporated in a tared dish over a water-bath until all chloroform has been removed. The weight is taken, and the alkaloidal residue titrated with $\frac{N}{10}$ HCl and $\frac{N}{10}$ NaHO, as previously described.

The modified process, for employment in laboratories when economy of time is an object, is as follows :

Two c.c. of the fluid extract is acidified and evaporated, and the alkaloids extracted with chloroform, as described under No. 3. The chloroformic solution of the alkaloids is evaporated to dryness and the residue titrated at once.

The following results were obtained :

	No. 1.		No. 2.		No. 3.		No. 4.	
	Weight.	Titration.	Weight.	Titration.	Weight.	Titration.	Weight.	Titration.
B.P. process	1·92	1·60	1·64	1·26	1·83	1·41	1·88	1·25
Wilson's "	2·23	1·93	1·85	1·57	1·97	1·64	1·95	1·62
F. & W. "	2·20	2·02	1·90	1·78	2·04	1·82	2·06	1·73
Quick "	—	1·97	—	1·74	—	1·80	—	1·72

For the determination of the alkaloidal value of the wine and vinegar, the following modification is given :

Fifty c.c. of the sample is placed in a porcelain dish, 10 drops of diluted sulphuric acid added, and the liquid evaporated to about 5 c.c. It is then transferred to a separator, the dish rinsed with a few drops of water and 10 c.c. of chloroform, and the alkaloids separated and determined exactly as described in the process recommended for the fluid extract.

Several commercial samples of the wine were determined by this method with the results shown in the table on following page.

The alkaloids from the wine were almost colorless, and the titration results show that they are yielded in an almost perfectly pure condition. This is evidently attributable to the fact that the impurity present in the crude alkaloids from the liquid extract, and which is most probably of a resinous nature, is thrown down and filtered out in the process of conversion into the wine.

The vinegar was not examined, but as it is prepared by simple dilution of the fluid extract, it is evident that the process employed for the wine is equally applicable to this preparation.

Sample.	Alkaloid Obtained.		Percentage in Wine.
	By Weight.	By Titration.	
No. 1	0·031	0·031	0·062
No. 2	0·022	0·022	0·044
No. 3	0·042	0·040	0·080
No. 4	0·012	0·012	0·024
No. 5	0·040	0·036	0·072
No. 6	0·022	0·021	0·042
Average	0·028	0·027	0·054

MISCIBLE LIQUID EXTRACT OF IPECACUANHA.

By F. C. J. Bird.

The liquid extract of ipecacuanha of the present Pharmacopœia is, undoubtedly, a great improvement on the dried acetic extract official in the last edition of that work. The new preparation possesses the advantages of standard strength, good keeping properties, and fine aroma of the root, but these good qualities are accompanied by the minor defect, from a pharmaceutical point of view, of precipitation when diluted with weak alcoholic or aqueous liquids.

The cause of this precipitation is usually attributed to the presence of resinous substances in the liquid extract, although the view has been advanced that the turbidity is partly due to the decomposition product of a peculiar pectin compound. There have been no published statements as to the nature of the deposit which in the official formula for the wine is directed to be filtered out, but if the wine be not free from astringent matter the sediment will certainly contain a little alkaloid. A liquid extract not forming a precipitate on dilution would, therefore, not only save filtration, but what is often of greater importance, avoid the forty-eight hours' delay incidental to the preparation of vinum ipecacuanhæ by the present B.P. formula.

The constituents of ipecacuanha root, isolated and identified by various observers, are the following: Emetine, cephaeline, and a third alkaloid (unnamed), ipecacuanhic acid, volatile oil, fat, resin and sugar, all of which are probably contained in the official liquid extract. There are also present in the root pectin, waxy bodies, dextrin, mucilage, albuminous substances, starch (in large proportion), and coloring matter. Other principles of doubtful existence have also been described.

The resins of ipecacuanha have never been credited with either emetic, diaphoretic or expectorant effects, and their entire or partial removal can hardly affect the medicinal action of any preparation of the drug, at least as far as those particular properties are concerned.

When an equal volume of water is added to liquid extract of ipecacuanha and the mixture allowed to stand, the filtered liquid will generally be found to form a perfectly bright solution when diluted with detannated sherry wine, and the following process for rendering the official liquid extract "miscible" is based on this fact.

Liquid extract of ipecacuanha B.P.	1,000 c.c.
Distilled water	1,000 c.c.

Mix, and allow to stand in a cool place for twenty-four hours. Filter and wash the residue on the filter paper with a little distilled water until colorless, keeping the washings separate. Acidify the filtrate with acetic acid, *q.s.*, to a very faint acid reaction. Distil by the heat of a water-bath until the distillate (as shown by volume and specific gravity) contains 400 c.c. absolute alcohol. This will generally measure about 520 c.c. Reserve this portion of the distillate, and continue the distillation to recover remaining alcohol. Evaporate the residue on the water-bath to about 420 c.c., allow to cool and pour off the bright liquid from any slight deposit of oily or resinous matter adherent to the dish. Add this to the reserved distillate. Rinse the dish with the washings obtained in the first part of the process, and filter, if necessary, and evaporate to make the total volume of the preparation equal to 1,000 c.c. Similarly a *glycerole of ipecacuanha* may be prepared as follows:

Liquid extract of ipecacuanha	1,000 c.c.
Distilled water	1,000 c.c.

Mix as before, allow to stand, filter and wash the residue, evaporating the washings separately. Acidify the filtrate with acetic acid to a very faint acid reaction, distil off the alcohol, and evaporate on a water-bath (adding the evaporated washings toward the end).

To	500 c.c.
Add glycerin	500 c.c.

This also forms a clear solution with detannated wine, syrups or aqueous liquids. It contains the B.P. proportion of alkaloid, and for many obvious purposes furnishes a convenient preparation of ipecacuanha.

An alternative process for the direct preparation of miscible liquid extract of ipecacuanha was also tried, and found to work well. It is as follows:

Ipecacuanha root in No. 120 powder	2,250 gms.
Calcium hydroxide	225 gms.
Alcohol (90 per cent.)	a sufficiency.

Pack the powdered ipecacuanha root lightly but uniformly in a conical percolator, add successive portions of 400 c.c. of the alcohol at intervals of twelve hours until the liquid begins to drop from the percolator; close the lower orifice, and set aside for twenty-four hours. Then percolate slowly until 700 c.c. have been collected. Continue the process as detailed in the Pharmacopœia. Recover the alcohol from the remaining percolates, evaporate on a water-bath to a soft extract, dissolve in the reserved portion and assay by B.P. method. Finally dilute with alcohol (90 per cent.) to a volume that shall contain 5 grammes of the alkaloids in 100 c.c.

Take of liquid extract of ipecacuanha (5 per cent.)	900 c.c.
Distilled water	100 c.c.

Mix, set aside for twenty-four hours in a cool place and filter. Wash the filter with sufficient distilled water to produce 2,000 c.c.

THE ASSAY OF THE LIQUID EXTRACT AND WINE OF IPECACUANHA OF THE B.P., 1898.

By W. A. H. Naylor and John J. Bryant.

The authors experimented with a number of processes, of which the following are deserving of mention.

(1) *The Lime Process.*—To 5 grammes of slaked lime in a basin add 5 c.c. of liquid extract, care being taken to prevent the latter from coming into direct contact with the containing vessel. The measure is rinsed with alcohol and the rinsings added to the lime mixture, and the whole dried over a water-bath. The dry residue is next exhausted in a Soxhlet by boiling ether. The ethereal solution is extracted with ½ per cent. sulphuric acid, and the latter with ammonia and chloroform. The residue from the chloroformic extractions was dried and weighed.

The only object in including Glenard's process is to point out the exact cause of the low results yielded by it. The explanation is rendered possible by the elaborate researches of Paul and Cownley on ipecacuanha. Small quantities of the alkaloids, emetine and cephaeline in a pure condition were treated alone and separately by the lime process exactly as with the liquid extract, the alkaloid being first dissolved in alcohol. The results here tabulated clearly show that the loss of alkaloid is due to the action of the lime on the cephaeline, the emetine being uninfluenced by the treatment.

TABLE II.—LIME PROCESS WITH PURE ALKALOIDS.

Alkaloid.	Amount Taken.	Amount Returned.	Per Cent. Returned.	Per Cent. Loss.
Emetine	0·100	0·098	98	2
Cephaeline	0·074	0·060	81·09	18·91

(2) *Kieselguhr Process.*—To 5 grammes of kieselguhr, freed from every trace of lime, placed in a porcelain basin, add 5 c.c. of the liquid extract, and dry the mixture over the water-bath. The dry powder, after transference to a Soxhlet, is then treated throughout by Ransom's[1] ammoniated chloroform process. The chief drawbacks to this method are the time and care required for its exact performance.

(3) *Process.*—To 5 c.c. of the liquid extract, placed in a porcelain basin, add two drops of diluted sulphuric acid, and heat over the water-bath gently to drive off the spirit. The acid solution is then transferred to a separator, together with the small portions of water used for washing the basin, ammonia is added in excess, followed by 10 c.c. of chloroform and agitated. The agitation and separation with chloroform is twice repeated. The chloroformic solutions are mixed and extracted with 10 c.c. of ½ per cent. sulphuric acid thrice repeated. The separated acid solutions are united, rendered alkaline with ammonia and extracted with three successive 10 c.c. of chloroform. The chloroformic solutions are evaporated and the residue dried, weighed and titrated with $\frac{N}{10}$ HCl. Although the process is not open to the charge of inaccuracy, it has the one serious defect of consuming much time, owing to the

[1] "Year-Book of Pharm.," 1887, p. 450.

great difficulty with which the separations take place, even when the separator is immersed in hot water. After giving this process a fair trial and experimenting further, the authors decided to abandon it and to adopt the following :

(4) *Process.*—Place 10 c.c. of liquid extract in a basin over a warm water-bath until the alcohol is dissipated. The solution is transferred to a 50 c.c. flask, and the basin is washed with small portions at a time of a mixture of 2 c.c. of diluted sulphuric acid and 30 c.c. of water. The solution is filtered and water passed through the filter until the volume measures 50 c.c. Of the filtrate 25 c.c., representing 5 c.c. of liquid extract, is transferred to a separator, together with the small portions of water used for washing the measure, and the solution is shaken up with 10 c.c. of chloroform. After removal of the separated chloroform, the solution is agitated with another 10 c.c. of chloroform, which, after separation, is also withdrawn. The solution is then made alkaline with ammonia and extracted successively with 3 × 10 c.c. of chloroform. The chloroform solutions are mixed, evaporated and the residue weighed and titrated with $\frac{N}{10}$ HCl.

The accuracy of this process is shown in an appended table, which gives strictly comparable results on the same sample of liquid extract. An additional recommendation is the rapidity with which the assay can be made. Its distinctive feature is the removal of the resinous substances by a rapid and simple method without loss of alkaloid, thereby making possible the quick separation of the chloroformic solutions.

TABLE III.—COMPARATIVE RESULTS.

Process.	Amount of Liquid Extract Taken in C.c.	Weight of Alkaloid Obtained.	C.c. of N_{10} HCl Absorbed.	Yield of Alkaloid by Titration.	Amount of Impurity.	Alkaloid in Grammes per 100 C.c. Liquid Extract.	
						By Weighing.	By Titration.
B.P., 1898 . .	20	0·402	14·0	0·3374	0·0646	2·010	1·687
Wilson's . .	20	0·400	13·5	0·32535	0·07465	2·000	1·62675
Lime	5	0·088	2·8	0·06748	0·02052	1·760	1·3496
Kieselguhr .	5	0·106	4·0	0·0964	0·0096	2·120	1·928
No 3	5	0·114	4·2	0·10122	0·01278	2·28	2·0244
No. 4	5	0·110	4·1	0·09881	0·01119	2·20	1·9782

In the above examinations the separations in most cases were troublesome, owing to the liquid extract being very resinous.

The calculations are made upon the basis that 1 c. c. of $\frac{N}{10}$ HCl is equivalent to 0·0241 gramme of mixed alkaloids, titration being conducted as given in the B.P., 1898, page 104, under belladonna assay.

As alkaloidal residues differ in their degrees of purity, we are of opinion that their amount should not be determined by gravimetric processes, but that their titration should be insisted on.

In the following table the results given are obtained from six samples of liquid extract by the foregoing processes, titrations excepted, and by the processes respectively of Wilson and the Pharmacopœia :

TABLE IV.—ASSAYS OF LIQUID EXTRACT.[1]

No. of Sample.	B.P., 1898, Process.	Wilson's Process.	Lime Process.	Process No. 3.	Process No. 4.
1 (*a*)	1·94	2·25	1·28	—	—
(*b*)	2·0	2·13	1·38	—	—
2 (*a*)	2·94	3·16	2·2	3·384	—
(*b*)	2·995	3·11	2·1	3·296	—
3 (*a*)	1·90	2·053	1·452	2·268	2·273
(*b*)	1·905	2·014	1·521	2·301	2·289
4 (*a*)	3·025	3·275	1·64	3·584	3·528
(*b*)	3·001	3·112	1·484	3·406	3·413
5 (*a*)	1·886	2·013	1·382	2·304	2·289
(*b*)	1·950	1·998	1·525	2·288	2·249
6 (*a*)	1·996	2·135	1·463	2·401	2·368
(*b*)	1·935	2·104	1·612	2·397	2·349

[1] The figures refer to grammes of alkaloid per 100 c.c.

For the assay of the wine the following adaptation of the previous process is recommended. One hundred c.c. is evaporated over the water-bath to 10 c.c., a little kieselguhr stirred in, the mixture transferred to a beaker and the basin washed with the mixture of 2 c.c. of dilute sulphuric acid and 30 c.c. of water. The solution is then filtered and water passed through the filter until the volume measures 50 c.c. Of this filtrate 25 c.c. is taken, which represents 50 c.c. of the wine, and the remaining operations are conducted as detailed in process No. 4.

The appended table shows the results yielded by three samples of wine :

TABLE V.—VINUM IPECACUANHÆ, B.P., 1898, ASSAYED BY PROCESS 4.

Sample.	Amount of Wine Taken.	Weight of Alkaloid Obtained.	C.c. of N_{10} HCl Consumed.	Alkaloid Amount by Titration.	Amount of Impurity.	Alkaloid in Grammes per 100 C.c. of Wine.	
						By Weighing.	By Titration.
1 (*a*)	The representative of 50 c.c. for each assay.	0·039	1·5	0·03615	0·00285	0·078	0·0723
(*b*)		0·037	1·4	0·03374	0·00326	0·074	0·06748
2 (*a*)		0·044	1·8	0·04331	0·00069	0·088	0·08662
(*b*)		0·040	1·65	0·039765	0·000235	0·080	0·07953
3 (*a*)		0·033	1·3	0·03133	0·00167	0·066	0·06266
(*b*)		0·030	1·2	0·02892	0·00108	0·060	0·05784

The authors recommend a modification of process No. 4 for the assay of the wine, as follows: 100 c.c. are evaporated on a water-bath to 10 c.c. and a little kieselguhr stirred in; the mixture transferred to a beaker and the solution washed with the sulphuric acid and water mixture, the subsequent steps being much as before. A table is appended in the original, showing the results obtained in the examinations of the wine by this process.

JOHORE IPECACUANHA.

By John C. Umney and Ralph S. Swinton.

The authors have examined Johore ipecacuanha, the root of *Psychotria emetica*, and state that it differs but little in character from the same root imported from Brazil. The proportion of total alkaloids present was found to be 1·7 per cent., and the mean of three experiments showed the percentage proportions to be emetine, 72·94, cephaeline, 22·94, other alkaloidal matter, 4·12, the figures corresponding closely with those recorded for the Brazilian root. It is suggested that there appears to be no reason why the root should not be used for making standard preparations of ipecacuanha.

THE ALKALOIDAL STRENGTH OF COMMERCIAL SAMPLES OF THE OFFICIAL PREPARATIONS OF JABORANDI.

By E. H. Farr and R. Wright.

The authors, having experienced great difficulty in preparing standard preparations of jaborandi from commercial samples of the leaves, have conducted an investigation into the strength of the tincture and liquid extract as found in pharmacy, the process employed for the determination of the alkaloids being the one devised by the authors in connection with their former work on tincture of jaborandi. As a result, they find that the galenical preparations of jaborandi found in retail pharmacies at the present time are very deficient in strength, only containing about one-fifth the proportion of active constituents which, judging from the official doses, they are supposed to contain. The explanation suggested is that the best jaborandi leaves are being withdrawn from the drug markets, and so prevented from coming into the hands of pharmacists.

THE ASSAY OF PREPARATIONS CONTAINING PILOCARPINE AND THE CHARACTERS OF THE PILOCARPINE NITRATE AND HYDROCHLORIDE.

By H. A. D. Jowett.

The author deals with the assay of preparations containing pilocarpine and the characters of salts of that base. Having extracted the mixture of amorphous bases from jaborandi or its preparations, he dissolves them in a small quantity of a saturated alcoholic solution of pilocarpine nitrate, adds some strong alcoholic solution of nitric acid, and then sets the mixture aside to crystallize. The crystals which form are filtered off, drained by the filter pump, washed with more saturated alcoholic solution of pilocarpine nitrate, dried and weighed. The percentage of bases in the total alkaloid yielding crystalline nitrate can then be calculated. In most cases the total alkaloid may be assumed to be pilocarpine, but if a very accurate determination be required, the melting-point and specific rotation of the nitrates should be determined.

With regard to the characters of the pilocarpine salts, the author thinks that the nitrate should consist of permanent white crystals, soluble in 6 or 7 parts of water and 146 parts of 95 per cent. alcohol, fairly soluble in boiling alcohol but almost insoluble in ether or chloroform. When heated in a capillary tube the salt should melt at 176° to 178°, and its specific rotatory power in aqueous solution should be + 81° to + 83°. No residue should be left on ignition, and there should be no precipitate on adding ammonia water, or sodium, or potassium hydroxide to a concentrated aqueous solution. The hydrochloride should form deliquescent crystals, soluble in less than their own weight of water, and in 10 parts of absolute alcohol, but almost insoluble in ether or chloroform. The dried salt should melt at 200° to 204°, and its specific rotatory power should be + 90° to + 92°. No residue should be yielded on ignition, and a concentrated aqueous solution should give no precipitate with ammonia water, and only a few oily drops, which quickly redissolve, on the addition of sodium or potassium hydroxide.

DELPHINIUM STAPHISAGRIA.

By E. M. Holmes.

The author directs attention to the fact that the true *Delphinium Staphisagria* is practically unknown in botanic gardens of England, and that the plant which passes under that name is really another species, viz., *D. pictum*, Willd. The difference between these two species is given in detail in the paper.

THREE NATURAL RUBBER SUBSTITUTES.

By David Hooper.

The author describes three elastic gums which have been suggested as rubber substitutes. The first is obtained from the stem of *Ficus bengalensis*, and dissolves without previously swelling in ether, chloroform and carbon disulphide. It contains a large proportion of resins. The second is the product of *Calotropis gigantea* and *C. procera*, and contains but little caoutchouc. The third substance is the coagulum of the milky juice of *Excœcaria azallocha*, Linn. It possesses irritating properties, and that fact, conjoined with the presence in the substance of alcohol-soluble resins, contraindicates its fitness to serve as a rubber substitute. None of the three substances, in fact, appears suitable for that purpose.

THE LIBERATION OF CO_2 FROM SODIUM BICARBONATE BY HEAT.

By C. S. Dyer.

In this paper the author deals with the liberation of carbon dioxide from sodium bicarbonate when heated, and doubts the accuracy of Cowie's statement that the salt decomposes at a temperature between 50° and 60° C. In his opinion, the detection of traces of carbon dioxide by a delicate test on exposing a bicarbonate to a temperature of about 55° C. is not sufficient evidence that the salt decomposes at that temperature to any practical extent, and he asserts that dry sodium bicarbonate scarcely decomposes at all below 60° C., only slowly below 100° C., but rapidly above 120° C.

THE DETERMINATION OF DIABETIC GLUCOSE. PICRIC AND FEHLING'S METHODS COMPARED.

By R. H. Parker.

A comparison of the picric and Fehling methods for the determination of glucose in diabetic urine shows that the advantages of the latter when dealing with high percentages may be realized in an equal degree by adding a known quantity of glucose before determination. He finds that the production of opacity in Fehling's solution by alkalized urine is characteristic of glucose. "Interfering substances" do not produce that opacity, and rarely occur in greater quantity than a picric indication of 0·35 per cent. of glucose. When the picric indication falls below 0·4 per cent., the actual amount of glucose present may be approximately ascertained by noting the point at which opacity appears. Finally, samples of urine giving the non-subsiding yellow cuprous oxide may be rapidly assayed with Fehling's solution, if previously mixed with an equal volume of 6 to 8 per cent. glucose solution.

ANALYTICAL NOTES ON THE B.P. LOZENGES.

By Frederick Davis.

In the following table are given the results of a series of analyses of B.P. lozenges, showing the quantity of active principles found in each lozenge.

It will be observed the quantity of active ingredient is very nearly that which the B.P. directs, and, taking into consideration experimental error, the constants are good excepting in the lozenges of sodium bicarbonate and sulphur, and in these cases there appears to be a laxity in making which should not exist. In the reduced iron lozenge the determination was calculated upon 75 per cent. basis of metallic purity. In the rhatany and cocaine lozenge the cocaine hydrochloride only was determined, and similarly the morphine hydrochloride in the morphine and ipecac lozenges. No examination of the basis has been made in any case:

Sample.	Benzoic Acid.	Carbolic Acid.	Tannic Acid.	Bismuth.	Catechu.	Eucalyptus.	Reduced Iron.	Guaiacum.	Ipecac.	Krameria.	Krameria and Cocaine.	Morphine.	Morphine and Ipecac.	Potassium Chlorate.	Santonin.	Sodium Bicarbonate.	Sulphur.
I .	·54	1·01	·51	2·1	Not determined.	Not determined.	1·2	Not determined.	Not determined.	Not determined.	·038	·028	·029	3·2	·98	4·2	6·5
II .	·55	1·01	·50	2·03			1·1				·049	·030	·031	3·02	1·02	3·5	5·9
III .	·52	1·12	·54	2·00			1·00				·044	·028	·028	3·19	1·15	3·1	5·2
IV .	·50	1·08	·53	2·09			1·05				·05	·026	·029	3·2	1·1	3·3	5·3
V .	·52	1·14	·49	1·97			1·08				·042	·027	·031	3·6	·92	4·1	7·4
VI .	·54	·98	·49	2·00			1·18				·031	·032	·027	3·03	1·21	3·9	6·9

HYDROGEN PEROXIDE.

By Chas. T. Tyrer.

The author has endeavored to give some idea of the rate of decomposition and the protective value of various agents in solutions of hydrogen peroxide.

The author considers hydrochloric acid to be the worst protective agent and phosphoric acid the best, glycerin coming second. Champagne quarts and soda-water bottles are found to be less liable to break in transit than other containers of hydrogen peroxide solution; beer bottles with patent screw stoppers come next in order. It is recommended that the containers be always filled to within about two inches of the corks. For storing the peroxide in a laboratory, the author advises the use of a receiver with a tap at the base, the solution being protected by a layer of petroleum carefully poured on the surface.

LIQUOR BISMUTHI ET AMMONII CITRATIS.

By Frank R. Dudderidge.

The author adopts a method of assay which differs from the B.P. process in the following respects:

(1) The solution of bismuth oxynitrate in equal volumes of nitric acid and distilled water is *not* added till opalescence is produced; it is not diluted at all; (2) the order of mixing is reversed, the potassium salts not being added to the bismuth, but the bismuth poured carefully into the solution of the potassium salts, which is kept well stirred all the time; (3) the potassium salts are dissolved in a definite quantity of water, two fluidounces for an imperial pint of product, or 100 c.c. for a litre. This forms a thick magma, to which is added another two ounces or 100 c.c. of water, then heated to the boiling-point, thrown on to a filter and washed with hot water until free from nitrate contamination, when it is easily soluble in liq. ammoniæ. He also finds that if the quantity of potassium carbonate be increased by one-third, *i. e.*, 240 grains or 27 grammes being used in place of 175 grains or 20 grammes, the washings are practically neutral, and very little, if any, loss of bismuth results. With these slight modifications, the B.P. process may be easily and speedily performed in any pharmacy.

THE EXAMINATION OF THE TERPENELESS OILS OF LEMON AND ORANGE IN THE MARKET.

By T. H. Williams Idris.

The author has examined the terpeneless oils of lemon and orange on the market, and records the results, which show great difference in the value of the respective products. Users of terpeneless oils are warned to exercise caution in purchasing so-called "terpeneless" and "concentrated" lemon oils offered at absurd prices.

TEREBENE, B.P.

By Lewis Ough.

The author has attempted to ascertain to what extent commercial specimens of terebene correspond with the B.P. requirements for that article, and, as a result, he finds that it is most varied in its composition, only one sample out of twelve being in strict accordance with those requirements. The solubility of the samples in 90 per cent. alcohol varied from 4·75 to 6 per cent., the solubility in pure ether (specific gravity, 0·720) from 1 in 10 to 1 in 20, and the solubility in methylated ether (0·717) from 1 in 1·4 to 1 in 2·5. The optical rotation also varied greatly in the different samples.

OIL OF CARDAMOMS.

By E. J. Parry.

The author points out that the chemistry of oil of cardamoms is in a very "hazy" condition, owing to the fact that those who have reported on the subject rarely state what they mean by "cardamoms." For experimental purposes the author has had Malabar and Mysore cardamoms specially distilled, and has examined the resulting oils. The Malabar cardamoms yielded 1·3 per cent. of oil and the Mysore variety 2·6 per cent. They were both light-yellow in color, scarcely distinguishable in odor, and having a specific gravity of 0·948; but whilst the optical rotation of the Malabar oil was + 40° 41′, that of the Mysore oil was + 46° 39′. The oils were soluble with a slight opacity in 40 to 45 volumes of 60 per cent. alcohol, and but little difference was apparent between them. Inasmuch, however, as the Mysore cardamoms yield twice as much oil as the Malabar variety, the former are preferable for distillation purposes.

ALMOND AND OTHER KERNEL OILS.

By Ralph S. Swinton and John C. Umney.

The authors are of the opinion that the B.P. test for almond oil is not defined with sufficient accuracy, but that inability to comply with its requirements indicates admixture with apricot kernel oil. Certain marked differences are also shown when the test is applied to apricot and peach kernel oils.

THE COMPOSITION OF COMMERCIAL ARAROBA.

By Edwin Dowzard.

The following table gives the results obtained in the examination of nine samples of commercial araroba:

	No. 1.		No. 2.		No. 3.		No. 4.	
	Sample as Rec'd.	Dried Sample.	Sample as Rec'd.	Dried Sample.	Sample as Rec'd.	Dried Sample.	Sample as Rec'd.	Dried Sample.
Chrysarobin . .	54·90	78·50	51·37	75·61	62·39	76·65	64·40	82·67
Water	30·06	—	32·06	—	18·60	—	22·10	—
Woody fibre, etc.	14·13	20·20	14·02	20·64	18·51	22·74	13·20	16·95
Ash	0·91	1·30	2·55	3·75	0·50	0·61	0·30	0·38
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

No. 5.		No. 6.		No. 7.		No. 8.		No. 9.	
Sample as Rec'd.	Dried Sample.	Sample as Rec'd.	Dried Sample.	Sample as Rec'd.	Dried Sample.	Sample as Rec'd.	Dried Sample.	Sample as Rec'd.	Dried Sample.
65·99	85·14	62·00	75·51	43·79	59·02	44·34	51·80	49·97	62·70
22·50	—	17·90	—	25·80	—	14·40	—	20·30	—
11·11	14·35	19·71	24·01	26·90	36·25	32·96	38·50	23·27	29·20
0·40	0·51	0·39	0·48	3·51	4·73	8·30[1]	9·70	6·46[1]	8·10
100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

[1] Consists principally of coarse sand.

SYRUP OF BALSAM OF TOLU.

By E. H. Farr and R. Wright.

The authors point out that the loss of volatile matter in the process of boiling tolu balsam with water, and the subsequent copious separation of crystals appear to indicate that the official method for preparing syrup of tolu is somewhat defective. As the result of experiments they find that the official syrup liable to vary considerably, according to the time of year when it is made, an further that the solution obtained on boiling the tolu with water should be filtered as soon as it reaches a given temperature, and immediately converted into syrup. Several samples of the syrup have been prepared by different processes, and the authors suggest the replacement of the official process by one in which the tolu is first dissolved in 90 per cent. alcohol, the solution added to water previously heated to 70° C.; the mixture is shaken well and set aside for twenty-four hours, then filtered bright, and mixed with seven times its volume of simple syrup. The solution may be kept and diluted as required. The crystals which deposit in cold weather dissolving when the bottle is removed to a warm place.

THE STRENGTH OF CAPSULES OF BLAUD'S PILLS OF COMMERCE.

By C. E. Stuart.

The author has had occasion to examine a number of capsules containing Blaud's pill, and in each case he found the iron salt was rendered semi-fluid by admixture with liquid paraffin or some other oily body. The iron contents of the capsules varied considerably, but, judging from some of the samples examined, the author is of opinion that the problem of preparing a small and active Blaud's pill capsule has as yet not been satisfactorily solved.

FURTHER NOTE UPON FERRUM REDACTUM B.P., 1898.

By E. Saville Peck.

The author has compared his results of the determination of ferrum redactum by the methods of the British and United States Pharmacopœias with those of the "iodine method." He finds that the mercuric chloride and iodine methods give almost similar results with samples differing widely in percentage of pure iron, and, from that fact, he thinks it may be inferred that one corroborates the other. Attention is also again directed to the fact that the copper sulphate method invariably gives a higher reading than the mercuric chloride method, the average difference varying in different samples, whilst the lower the percentage of pure iron in the sample the greater is the difference in the results of the two methods. The copper sulphate method is, therefore, held to be less satisfactory in use than the other two methods.

THE ASSAY OF BELLADONNA PLASTERS.

By H. J. Henderson.

The author gives the details of a process for assaying belladonna plasters prepared in accordance with the B.P. formula. The plaster is allowed to disintegrate with ether and the mixture is then shaken with acetic acid. Sulphuric acid is next added to the separated acid liquor, the lead sulphate allowed to subside, and the belladonna extract separated from the other constituents of the plaster. The alkaloids are then shaken out with ammonia and chloroform,

next taken up with hydrochloric acid, and finally obtained in crystalline form and weighed. Applying the process to a plaster prepared by himself from liquid extract of belladonna, the author found the plaster contained exactly 0·5 per cent. of alkaloid.

MELTING-POINTS.

By T. Tyrer and A. Levy.

The results of a series of determinations of melting-points are given by the authors, five methods being employed for each substance—phenacetin, sulphonal, acetanilide and phenazone. The methods were that official in the B.P., Graebe's, Landolt's, Piccard's and Loew's. Somewhat high results were obtained with the B.P. method, but Graebe's and Landolt's methods were found to agree fairly well.

A NOTE ON COMMERCIAL CARBON DISULPHIDE.

By W. Elborne.

The author kept 200 c.c. of the best commercial carbon disulphide in a clear glass bottle, corked and capped with parchment paper, for six months, and exposed to strong diffused daylight. A flocculent brown precipitate was formed, which showed no traces of sulphur and when heated gave off an inflammable vapor, leaving a residue of carbon. The author concludes that either the CS_2 contained impurities (probably derived in part from the cork) or that it is itself decomposed when kept in a cork-stoppered bottle. He recommends that CS be kept in a glass-stoppered bottle, and as far as possible from the light.

DRUG STANDARDS.

C. G. Moor and C. H. Cribb.

The authors suggest the voluntary adoption of standards of purity by pharmacists, analysts and other interested persons. The substances selected as typical for the purposes of this paper are dill fruit, cayenne pepper, cloves, ginger, saffron, mace, malt extract and pimento, tinctures of aconite, arnica, cantharides, hyoscyamus and rhubarb.

THE SALIENT FEATURES OF THE FLORA OF DEVONSHIRE.

By G. C. Druce.

The county of Devon possesses more than 100 species which are not native in Ireland, nearly 140 which are not native in Scotland, and nearly 180 which do not occur in Oxfordshire.

WEIGHT BURETTE.

By E. Saville Peck.

The author describes a burette which can be weighed before and after titration, thus giving the weight of the solution used instead of its volume. It is claimed that the errors arising from inaccuracy of calibration are entirely eliminated, and that changes and differences in temperature exert no influence upon the results.

THE BONE CAVES OF SOUTH DEVON.

By R. Hansford Worth.

This is a very interesting short note on the bone caves of Devon.

CORRESPONDENCE.[1]

CÚCUTA, COLOMBIA, January 9, 1899.

Mr. William P. Wilson, Philadelphia.

DEAR SIR :—We send you samples of the fluid extract and of the chopped root of Jatropha gossypifolia, that you may have an opportunity to experiment with it and make the results to be widely known.

We have been induced to do so through the use that we made lately of the juice of the plant as a powerful therapeutic agent in a case of Greek leprosy or elephantiasis. Nevertheless, its action is simply purgative and emetic. It can be placed among the strong purgatives, with a much surer action than jalap, scammony, gum-gutta, turpeth root, etc. Its emetic action is weaker than that of ipecacuanha. As it is found in great abundance, it could take the place of all other plants of its class, and on that account we hasten to inform you.

We have calculated the maximal dose of the fluid extract at 3 grammes for an adult, although we think that not more than 0·50 gramme should be used at once. This preparation offers great advantages in therapeutics, which should not be despised, especially when its growth is abundant, the cultivation easy and not at all costly.

Will you please inform us in regard to the price at which it could be sold in that country as a trial export article? We believe that it is more or less our duty to help matters along toward progress and industry.

Remaining entirely at your orders, we subscribe ourselves,

Your attentive servants and friends,

MANTILLA Y CIA.

MINUTES OF COLLEGE MEETING.

A quarterly meeting of the members of the Philadelphia College of Pharmacy was held at the College, June 26th, at 4 P.M., President Charles Bullock in the chair. Eighteen members were present. A letter was read from the Secretary, W. Nelson Stem, regretting inability to be present on account of sickness in his family. J. W. England was elected secretary *pro tem.*

The minutes of the March meeting (Wm. B. Thompson, Secretary) were read. The minutes were then adopted as amended.

The minutes of the April, May and June meetings of the Board of Trustees were read and approved.

The amendment to Chapter IV, Article IV, of the by-laws, proposed at the March meeting of the College, was adopted.

Prof. J. P. Remington gave an interesting verbal account of the recent meetings of the Pennsylvania Pharmaceutical Association held at the College. The meetings were very well attended, the papers were good, the business of the Association was satisfactorily and expeditiously done, the social features evoked general praise, and, altogether, the meeting was one of the most successful of years. A pleasing feature of the meeting was the election of a

[1] The above letter sent to Dr. W. P. Wilson, Director of the Philadelphia Commercial Museums, is a translation of a communication received by the Philadelphia Museums from a correspondent in the United States of Colombia. The samples referred to are in the Museums' collection and may be seen by any one interested.

fellow-member of the College—Dr. Charles A. Weidemann, '67—as a vice-president of the State Association.

The following delegates were appointed to attend the meeting of the American Pharmaceutical Association, to be held at Put-in-Bay early in September next: Prof. Henry Kraemer, F. W. E. Stedem, Wm. McIntyre, Wm. L. Cliffe, George M. Beringer. The delegation was given power to fill vacancies.

The meeting, on motion, adjourned.

J. W. ENGLAND,
Secretary pro tem.

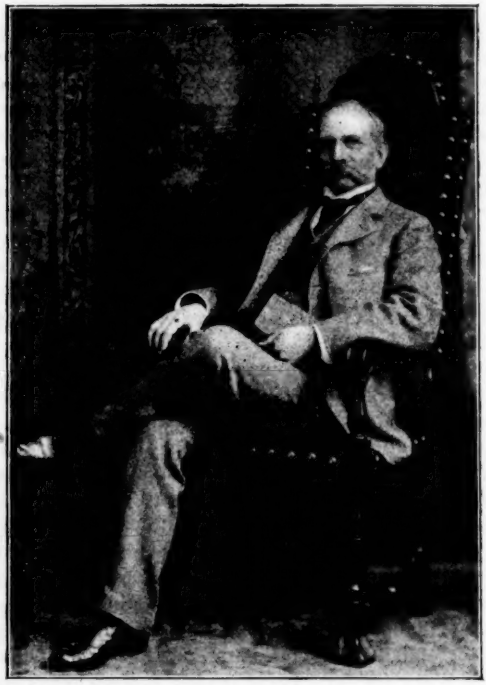
PERSONAL.

CHARLES F. CHANDLER.—To few men is given the privilege of seeing the fruition of their labors while still full of all the powers of the mind and body. Thirty-five years ago Dr. Chandler—then not quite thirty years of age—started, with the co-operation of Professor Egleston and General Vinton, the School of Mines of Columbia College. Leaving Union College with an assured income and everything that could be desired in many ways, he ventured on what seemed to be to others an unpromising project, without a salary and with an institution poorly equipped in every way, but with men of brains, enthusiasm and determination to succeed. Since that time the school has grown, until the chemical department alone has the most elegant and commodious building devoted to chemistry to be found anywhere (known as Havermeyer Hall, and provided by the Havermeyer family), costing $750,000, and equipped with almost everything that can be desired.

Professor Chandler has been a pioneer in many directions. Born in Lancaster, Mass., with that "I-want-to-know" disposition, he was not content with the realization of years of scientific studies in Harvard, Göttingen and Berlin, but determined to turn it to account for the benefit of the people with whom he lived, and who called upon him for his services. As a chemist and subsequently as President of the Board of Health in New York City, he contributed a noteworthy chapter to the sanitation of the city. He was instrumental in securing the introduction of a proper system of plumbing and house drainage, the permanent system of gratuitous vaccination, the proper care of contagious diseases in special hospitals, the abatement of the sludge oil nuisance, the regulation of the sale of dangerous kerosene oil, adulterated liquors, and the regulation of the water and milk supplies, etc., etc. Any one who has heard Dr. Chandler lecture daily for four years readily comprehends why he has not written books, as his time has been so fully occupied with the demands of his students as well as the public. There are probably few other teachers whose lives so enter into their work, and the notes of whose lectures are considered so invaluable, as that of Professor Chandler.

Many persons look upon Professor Chandler as being a "lucky" man. But if there is any man who is a living example of the essay of Sydney Smith on "Labor and Genius," it is Dr. Chandler. Every institution and organization with which he has been associated from its humble beginnings has sprung, through his unselfish and never-ceasing labors, to be recognized as a power for good. It is but natural for the multitude—who do not comprehend the powers of Dr. Chandler—to cry out

"a miracle of genius;" "yes, he is a miracle of genius because he is a miracle of labor; because, instead of trusting to the resources of his own single mind, he has ransacked a thousand minds; because he makes use of the accumulated wisdom of the ages, and takes as his point of departure the very last line and boundary to which science has advanced; because it has ever been the object of his life to assist every intellectual gift of nature, however munificent and however splendid, with every resource that art could suggest, and every attention diligence could bestow." All of his students know this too well. The Chemical Museum of Havermeyer Hall—not to be duplicated anywhere because of this spirit—speaks better than anything else of these qualities of Dr. Chandler. We do not wonder that the Society of Chemi-



cal Industry, at its recent meeting at Newcastle-on-Tyne, has honored Professor Chandler with the Presidency of that body. As we have already said, we appreciate that it is a great honor to Professor Chandler, but we also recognize that it is an honor for the Society to select such a man as President, who has been esteemed by men of letters, and science and art, as well as by men of large business enterprises of this and other lands, for nearly two generations. We rejoice that his step is as elastic, and his mind as active, and his health apparently as good to-day as ten years ago, when we first had the pleasure of knowing him.

HENRY KRAEMER, '95,
School of Mines of Columbia University.